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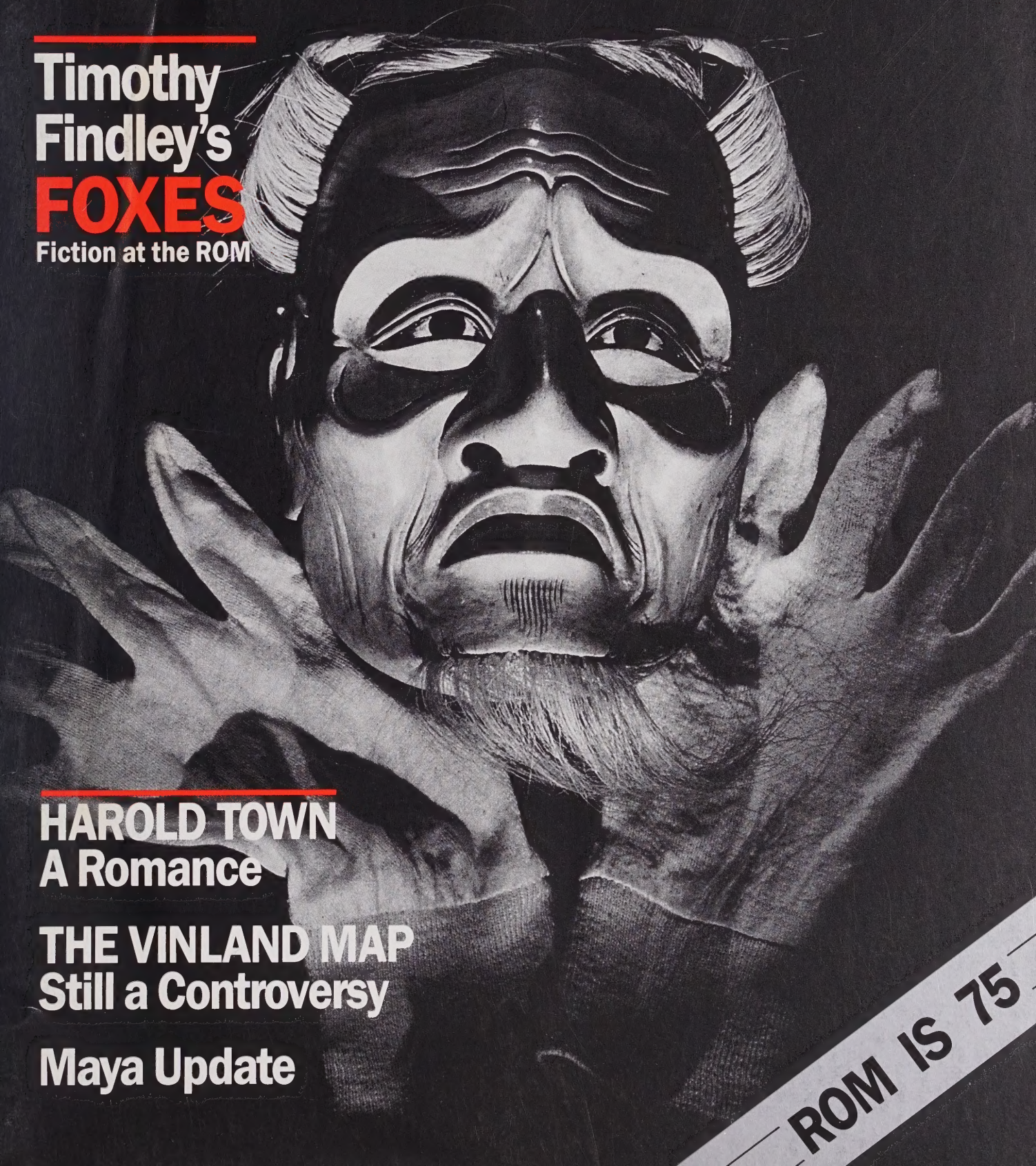
ROTUNDA

the magazine of the Royal Ontario Museum



Timothy Findley's FOXES
Fiction at the ROM

HAROLD TOWN
A Romance

THE VINLAND MAP
Still a Controversy

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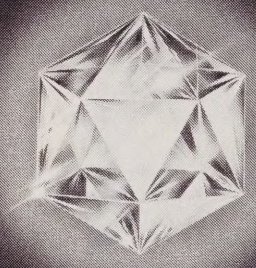

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Celebrating ROM's Seventy-Fifth

Seventy-five years is not a very great length of time in the greater scheme of things. When one considers the rapidly changing face of Toronto, however, the Royal Ontario Museum, which this year marks its seventy-fifth anniversary, stands securely as an enduring city landmark.

This does not imply that a visit to the ROM is as predictable as the CNE in late summer, the Nutcracker at Christmas, or Fran's apple pie twenty-four hours a day, seven days a week. Behind the familiar façade of the ROM, even frequent visitors will always find something new: an object or specimen that was previously overlooked or still another discovery about an old favourite.

In honour of this anniversary, we invited Timothy Findley and Harold Town, two longtime fans of the ROM, to contribute original stories based on their Museum experiences. Findley's "Foxes" was inspired by a hectic day spent behind the scenes that culminated in a visit to the Far Eastern Department. Once again Findley writes on the theme of searching for the truth that lies hidden beneath surface appearances.

"Charles Trick Currelly: Hero" is a touching account of an extraordinary individual, punctuated by the wit of artist and writer Harold Town. Enchanted first by the diversity of the Museum's collections, Town then became captivated by the story of the man behind the institution: C. T. Currelly. It's a shame that Currelly and Town weren't contemporaries because we suspect that a very rich and entertaining friendship would have developed.

Our next article returns us to more familiar territory. Readers of *Rotunda* have avidly followed the progress of ROM archaeologist David Pendergast in his excavation of Maya sites in Belize. In this issue Pendergast and Elizabeth Graham contribute an article that explains why no site is too small for serious consideration and excavation. The tiny Marco Gonzalez site has yielded new and important information about the trade and commerce of Maya civilization.

"Eye of the Beholder" is the name of the enjoyable exhibition of items of personal adornment now on display at the ROM. On the subject of personal adornment, Ruth Phillips writes about the all-female Sande society of the Mende tribes of Sierra Leone. Sande is a secret society in which young Mende females are guided through the passage from childhood to womanhood. Western art historians and anthropologists have been intrigued by the *sowei* mask worn by certain women during the Sande rituals. The mask, which represents the Mende ideal of feminine beauty, is the only mask worn by African women; in other African cultures, all masks, including those of female characters, are worn by men.

Fiction writers are lauded for their imagination. Scientists are supposed to receive praise for their presentation of hard, cold facts. Jay Ingram explains in his article about Yale University's Vinland Map that fact and fiction have become a bit blurred around the edges as scientists use different methods to authenticate the document.

We hope that you enjoy this special issue of *Rotunda*, which also marks the magazine's twentieth year of publication. We greatly appreciate the support of our readers and advertisers. And all of us at the ROM acknowledge the generous support of the Ontario Ministry of Citizenship and Culture for our seventy-fifth anniversary programs. Finally we are pleased to report that the ROM will receive its first major gift from the Government of Canada, Department of Communications, the Honourable Flora MacDonald, minister.

S. S.

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the magazine of the Royal Ontario Museum

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(Date of issue: May 1987)

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A Japanese theatre mask from the collection of the Royal Ontario Museum forces an unnerving confrontation with the truth in "Foxes," a short story for *Rotunda* by Timothy Findley. Turn to page 26. Photo by John Reeves.

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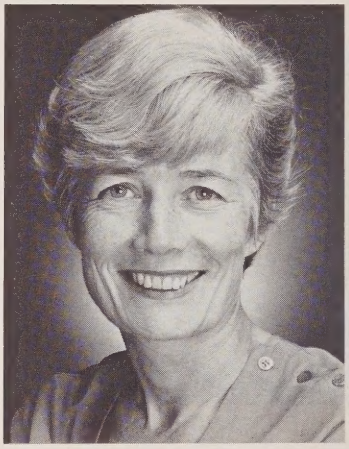

Dear Friends,

I am delighted to send my warmest greetings to the staff and members of the Royal Ontario Museum on its 75th anniversary.

From the start, the museum has been a community resource of the first order for Canadians. Its exhibits have whetted the curiosity of young and old alike for a better understanding of the world beyond their every day lives.

Of equal importance, however, is the original research which museum staff has done since the beginning. It is this which makes the Royal Ontario Museum unique in Canada and one of the outstanding museums of the world.

As Minister of Citizenship and Culture, I want to congratulate the board and staff for their hard work and ROM members for their unflagging support.

My best wishes for the next 75 years and beyond.

Yours sincerely,

Lily Munro

Lily Munro
Minister

Democracy vs Professionalism

There is a basic tension—even conflict—between modern democracy and professionalism. Modern democracy is a complicated social equation built on the axiom that any one person's view of any matter must be considered to be as valid and worthy of serious consideration as another's. "One man, one vote" is the way this proposition is usually stated in political terms, but the concept runs deeper than that: one person's position on a given subject is as *important* as another's. Professionalism is, or can be, the antithesis of this position: only those who are truly well-informed on a subject and who are therefore professionals can have a valid and worthwhile opinion on that subject. The underlying proposition is that while we may all be created equal, and you are certainly as worthy as I, when it comes to *my* profession and *my* subject, some of us are more worthy than others. Yet for some time now, the trend in our society has been to favour democracy and, at the same time, to encourage more widespread and pervasive professionalism.

The difficulties arising from the contradiction in this trend have had, and will continue to have, a marked effect on our cultural institutions in the same way that they have affected private enterprise. The changes that have taken place over the years at the Royal Ontario Museum clearly illustrate these difficulties.

In May of 1935 C. T. Currelly, then director of the Royal Ontario Museum of Archaeology, read a paper to the Annual Meeting of the American Association of Museums entitled "The training of a museum director." Both from its tone and from what it says explicitly, one gets the distinct impression that, as far as Currelly was concerned, the director was the real (and perhaps the only) professional in the institution: "To begin with, the director must have a very definite knowledge of the development of civilization, including the most primitive civilization, the rise of the grain areas, and the development of the arts." He goes on to state that building on that base, the director must be familiar with objects that have or might have a place in the museum, and particularly the materials that objects are made from—especially if they are made from stone. He does not need to know the scientific name of the stone, but he does have to recognize all the common types of stone that have been used down through the millennia to make objects. This talent is then combined with a "trained and professional ability to see," so that the two talents "form his chief and real equipment, and the supreme test of his ability to purchase." As for the "mechanical side of the museum" the director must have "a considerable amount of training in preservation and mending. . . . Closely allied to the preservation and restoration of objects is the question of cases, casing, and mounts. I feel that wherever possible, every museum director should design his own cases. . . ." Do not, Currelly says, even make drawings and blueprints. Design as you work in the shop so that the case will develop in an organic way out of the director's understanding of just what the object and the display needs.

Since 1935 it is fair to say that museum directors, on this model anyway, have made considerable progress in regaining their amateur status (the only one of these traits prescribed by Currelly that I share is that I know a little about the origins of cereal cultivation in the neolithic Near East). Fortunately we now have on staff professional curators who have the necessary "eye" and knowledge of rocks, trained conservators to do the mending, preparators to make the mounts, exhibit design staff to help

think through the galleries and special exhibitions, skilled craftsmen to build cases, and many others who really *know* what they are doing.

Some readers may be surprised that I have included curators in the list of new professionals at the ROM. At the outset, the Museum essentially had no curators. This was followed by a period when our first cadre of curatorial staff was hired and expected to learn on the job. They became a very distinguished group of professionals as their museum experiences and horizons broadened. In fact it was not all that long ago that the Museum began consistently to hire onto the curatorial staff people who could claim through their thorough training elsewhere that they *brought* a real professionalism to their curatorial tasks.

One could argue that over the past twenty years, the very rapid development of professionalism in areas of museum activity other than curatorial has been, in part, a response to the earlier development of professionalism in the curatorial ranks. I am sure such an argument is true, but it is not the whole story. As the demands put on the Museum by government, the public, and our professional colleagues have grown, so has professionalism grown in the ROM, for no institution with our kind of pride wishes to meet those demands in an amateurish way. Fortunately, in many non-curatorial areas, professional people were available who could adapt their skills to the Museum's special needs.

As well, an increasing number of museum professionals have been and are continuing to be trained in the various undergraduate and postgraduate programs in museology that have come into being over the same period of time. This is probably the ultimate development in the professionalization of museums. We, in league with society at large, have decided that work in a museum is something for which one can train and receive professional credentials. Here the ROM was a leader, having founded in cooperation with the University of Toronto fifteen or more years ago the Toronto Museology Program, which is still thriving today. Though still an infant discipline (and remember that the academic disciplines of most of the curatorial staff had their own infancy little more than a hundred years ago), it is clear that, following a general trend towards professionalism in our society, museology will be established as the background discipline for many on a museum's professional staff. So, it is clear that there has been a rapid rise in professionalism since those days not so long ago when the director had to be expert at everything so that there could be a professional on the job.

On the other hand, one significant reason for the trend towards greater democracy is an ever-increasing appreciation of an involvement with art and science. Art and science are liberating forces. They expand the mind and the soul. And expanded minds and souls create expanded hearts: in sum, an expanded humanity. Democracy is certainly one result of the rise and growth of humanism, which is a trend in our society that dates back at least to the 16th century. And the Royal Ontario Museum is dedicated to making accessible art and science to all who seek them. (We reached more than 1.5 million people last year.)

Thus the Museum is one of the causes of a move towards greater democracy. And yet the trend towards professionalism within the Museum and the community is antithetical, at heart, to this form of expression. And from that antithesis comes tension and some trouble.

For example, tension arises when as members of a democracy we insist on the right to pass judgement on the decisions and the work of others, yet as professionals we insist that such judgements on us are not acceptable when they touch our professional performance. Everyone else's business is my business, but my business is strictly mine. This kind of tension and the resulting conflicts can cripple any institution,

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just as they can do immeasurable harm to a society as a whole. They are most common and damaging in cultural institutions, which perforce, are staffed by a particularly wide range of quite different and disparate professions.

Although there are no perfect solutions, professionals working in a modern democratic organization, be it a museum or a highly diversified commercial corporation, can ease the tensions and conflicts in several ways.

First, when speaking out on any given issue, one needs to be explicit about whether the opinions expressed are professionally backed with the data or just general remarks. The person or people being addressed are thus aware of the context within which the discussion or argument is taking place. Second, one must provide those being addressed with the same kind of respect for their professionalism that one would expect in return. Finally, and perhaps most important, one must not make too much of professionalism itself. It should not be assumed that professional status guarantees automatic or exclusive access to all the facts.

It is dangerous to slip into the habit of thinking that a first-class professional in one profession possesses some mystical authority on other subjects. The fact that I am a leading authority on neolithic Near Eastern civilizations does not make me an authority on writing good English, on how to get my exciting discoveries into the press, or how best to display in an exhibition what I know about the civilizations. On the contrary I am grateful that unlike my predecessor, I am no longer forced to command such fields as publishing, publicity, and exhibit design; I leave this to the other pros while I expand my knowledge of archaeology.

What it comes down to is that professionals working in a modern democratic institution should "Do unto others as you would have them do unto you" — whenever the best in human nature makes that possible.

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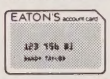

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Vegetal Art: A Visit to Villandry

GLORIA VARLEY

The legendary Villandry, one of the chateaux of the Loire Valley in France, is graced by a *potager* or kitchen garden.

From a short distance away it looks like a magnificent tapestry spread out over the level land: wine red, frothy white, greens that range from golden to jade to velvet grey, with here and there a taller punctuation point of vivid crimson or coral. But as you draw closer, admiration may well change to astonishment. That carpet of well-tended formal beds is a kitchen garden, a *potager*, flourishing with an exuberance of the season's finest produce. It is found at Villandry, one of the Loire Valley's legendary chateaux and the site of a masterful recreation of a 16th-century garden, the only one of its kind in France.

The chateau, which dates from 1536, rests on the foundations of a feudal fortress whose crenellated keep still stands guard at the south-west side of the present structure. Unlike so many of its sisters (Chenonceau and Azay-le-Rideau, for instance), Villandry escaped much of the rough-and-tumble of history. It was never seized by the king, for one thing—a favourite royal pastime when artistocratic property owners slipped from grace—and so it stayed a private home. Yet imperceptibly over the centuries, Villandry and its gardens languished. The architecture of the chateau was altered almost beyond recognition and the gardens, their symbolic plantings fallen in disarray, were uprooted and replaced with a design influenced by the British landscape school. Then, in 1906, rescue came.

GLORIA VARLEY

This *potager*, a recreation of a 16th-century garden, is the only one of its kind in France.

The saviour was a visionary Spaniard, Dr Joachim Carvallo, who abandoned his labours at the Faculty of Medicine in Paris and turned instead to a work of the heart. Backed by a force of one hundred masons, he knocked down partitions and restored the castle's façades to their original condition. In less than a week, Villandry regained its Renaissance character. Members of Touraine's archaeological society, invited to inspect, "could not believe their eyes," wrote Dr Carvallo, "and thought that, with the wave of a magic wand, I had constructed a new chateau."

Inspiration for the resurrection of the gardens, an undertaking as intricate and suspenseful as any mystery, was found in *Des Plus Excellents Bâtiments de France*, by Jacques Androuet Du Cerceau, published in Paris between 1576 and 1607. Here in a series of engravings were plans and elevations, the only surviving indication of Villandry's original glory. Aided by a flurry of gardeners (and his wife's considerable fortune), the doctor set to work.

This sort of *potager* originated in the Middle Ages when monks

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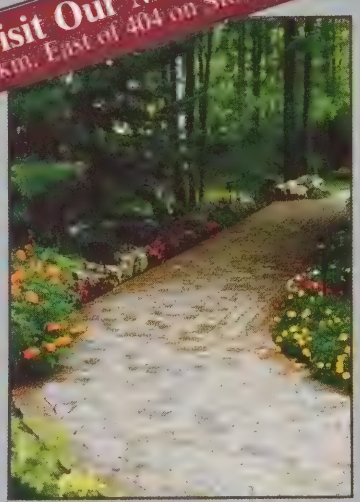

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devised patterns from the plants known to them, then edged the beds with aromatic herbs. They also began to plant flowers here and there for decoration, and added standard rose bushes, one to a plot, to symbolize each brother caring for his allotment, a tradition revived at Villandry.

Householders confronted by the difficulties of reviving a neglected backyard will have sympathy for the far vaster problems faced by Dr Carvallo. The original gardens had been arranged on three levels. At the top was a stream-sourced artificial lake whose waters fed the moat, the fountains, and the irrigation ditches. The middle level, beside the chateau's reception rooms, was given over to intricate box-rimmed flower beds, including the "Garden of Love," four squares that symbolized tragic, adulterous, tender, and passionate attachments. Spread over the last level was the most original planting of all, the ornamental kitchen garden: nine great squares, each arranged in differently patterned segments, a visual celebration of the beauty of vegetables and fruits.

Dr Carvallo restored it all, and the work was carried on by his family after his death in 1936. Today a grandson and his wife tend the property, relying on visitors' admission fees to pay for six full-time gardeners and several part-time employees, and to finance the maintenance (which alone accounts for a staggering one-and-one-half million francs per year).

The *potager* is planted in early spring and again in summer, and the mind-scrambling puzzles posed by such extensive crop rotation are complicated by aesthetic considerations that rarely hamper a home gardener. Peppers and tomatoes never appear side by side, for example, because their leaves are a similar shade of green. But feathery carrots make a good contrast to the sleek blue tops of leeks. Rhubarb chard with its vivid scarlet stems looks handsome next to the golden green of celery. Flowering cabbage—whether rose-hearted or white—is beautiful in almost any situation.

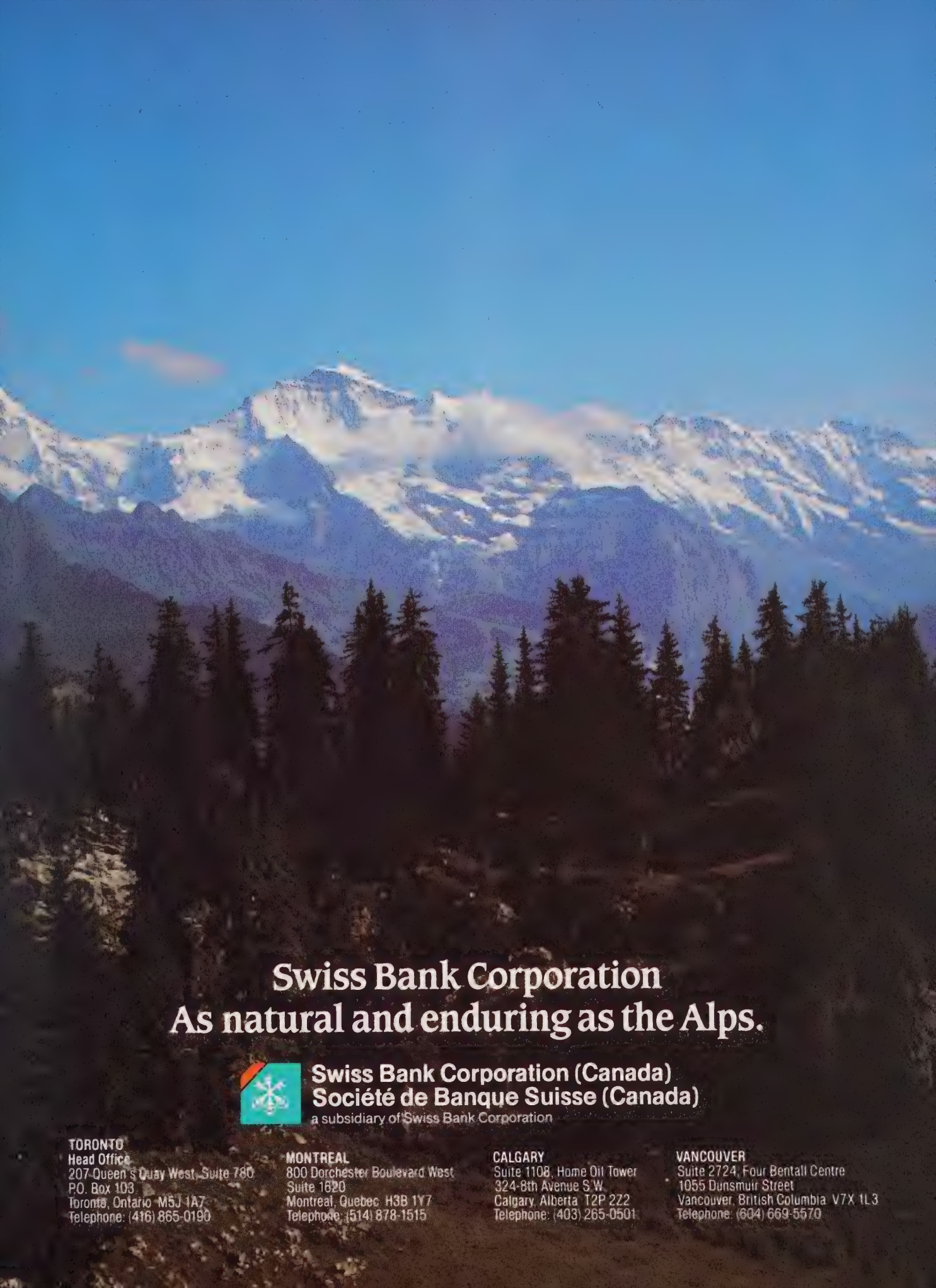
The garden regimen follows its plan as precisely as those old woodcuts that so charmingly picture the seasonal cycle of activity. Pruning begins in January. Hotbeds composed of fallen lime leaves and manure are prepared in February, ready for seed to be sown at the end of the month. In March, 60 000 more seedlings are started and the box hedges surrounding the vegetables—all nine-and-one-half miles of them—are clipped. April sees peas, broad beans, and lentils in place, with greenhouses full of spring cabbages set to follow. In May the summer crops are sown, ready to replace the spring plantings at the beginning of June. And so the year goes on.

Almost all the garden work is done by hand using traditional tools. Mercifully, watering no longer relies on men filling cans at the strategically placed fountains, then hauling them to the beds. A remote-controlled sprinkler network has eliminated that backbreaker, while electric clippers have simplified the equally daunting job of trimming hedges.

Villandry vegetables and fruits are more than just pretty faces. The owners and their employees harvest as many as they can eat. The rest, far from being wasted, are turned into compost to give strength to the next year's crop. Due attention is also paid to symbolic meanings. Peppers signify purification. Cabbage stands for happiness and prosperity, broad beans harbour the souls of the dead, while strawberries, if eaten by ghosts, make it impossible for them to return to this world.

Which the ghosts may find a pity. It's easy to imagine that they, like other visitors to the Loire, take delight in the grand chateaux, the restored medieval towns, and the region's excellent wine and food. Tempting as those ripe scarlet berries are, perhaps the hungry ghosts will dine on pumpkin and aubergine instead, and so linger contentedly a while longer in this happy place.

GLORIA VARLEY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Recipe for a Universe: A Review of the Basic Ingredients of the Cosmos

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From top to bottom: The proton, the electron, and the neutron are three particles found in atoms. They were discovered by physicists early in the 20th century.

How did the universe come into being? What is everything made of? Is there some order and simplicity underlying the veneer of complexity that we see around us? One of the goals of science and philosophy has been to seek answers to these questions; that is, to find the patterns that nature uses to build everything from the most basic substances to vast galaxies.

Chemists in the 19th century expanded upon the concept of atoms first proposed by Democritus around the 4th century B.C. They succeeded in determining that every substance was composed of different combinations of atoms. There are just over a hundred different types of atoms, such as hydrogen, oxygen, iron, and carbon. These are known as the basic chemical elements.

In the first part of the 20th century, physicists discovered that atoms, in turn, were composed of smaller units: a *nucleus* containing positively charged particles called *protons* and neutral particles called *neutrons*. Surrounding the nucleus was a cloud of negatively charged *electrons*. In the early 1930s, only one other particle was known to exist. This was the *photon*, which carries the electromagnetic force. Photons are particles of light.

It was thought that the proton, neutron, electron, and photon were four elementary particles, the smallest, simplest components into which all things could be divided. It was an appealingly simple arrangement, but as scientists discovered, it was too simple.

Theoretical and experimental developments began to reveal new particles: *neutrino*, *pion*, *kaon*, *sigma*, *lambda*, and *xi*, and scores of others. These discoveries led to the search for another level of structure within the proton, neutron, and their companions.

In 1964, Murray Gell-Mann and George Zweig proposed that protons, neutrons, and most other particles were composed of smaller pieces dubbed *quarks* (an obscure reference to a passage from James Joyce's *Finnegans Wake*). Though they are the basic ingredients of the universe, the realm of the quarks is far removed from our everyday experience. Because of this, physicists have been somewhat capricious in their naming of quarks and their properties. For example, quarks come in six varieties or flavours as they are known, grouped in three pairs: the *up* and the *down* quarks, the *charmed* and the *strange* quarks, and the *top* and the *bottom* quarks (the latter are also known as *truth* and *beauty*). However, everyday normal matter, such as you and I are made of, is composed of up and down quarks only.

It is not only their names that are unusual; quarks also have some bizarre properties. To begin with they cannot be seen individually; they are always bound together in pairs or triplets. The proton, for example, is composed of two up quarks and one down quark. Trying to isolate a lone quark is like trying to isolate one end of a string. The act of cutting it off creates another end. In the case of quarks, it takes so much energy to pull them apart that new partner quarks are created from the energy supplied.

The other unusual thing about quarks is that they carry fractional electric charges. Whereas protons and electrons carry a single positive and negative charge respectively, the up quark has an electric charge of $+2/3$ and the down $-1/3$. We never see these fractional charges in nature because quarks always combine so that the total charge is either $-2, -1, 0, +1$, or $+2$. For example, the two up quarks and one down quark in a proton add up to the known $+1$ charge.

For these and other reasons, the physics community did not receive the idea of quarks enthusiastically at first. However, experiments soon gave the theory credibility.

These experiments are performed with the use of machines called particle accelerators. Though they deal with the smallest pieces of matter, they are the largest machines on earth, up to several kilometres wide. One at CERN (Centre Européen de la Recherche Nucléaire) straddles the French/Swiss border.

First impressions are lasting impressions.

Original brass rubbing by Desmond Montague.

These devices can accelerate subatomic particles to speeds approaching the speed of light. How does this help?

Although the quarks cannot be pulled out of a proton for examination, they can be studied *in situ* by using particle accelerators to expose the inner structure of the proton. Electrons are much smaller than protons, therefore they can be used to probe the proton's interior. Much can be learned about the quark composition of a proton by using a particle accelerator to fire electrons at the proton and then observing how the electrons pass through or bounce off the quarks inside the proton.

In other experiments, particles are accelerated and then smashed together. This results in a cascade of fragments (pieces of the original particles) and new particles created from the raw energy of the collision. By studying the fragments, physicists can determine how the quarks (and other particles) interact. This method of experimentation has been compared to trying to understand how a watch works by smashing it with a sledgehammer and then examining the pieces. The difference is that we can hold a watch in our hands to study it. We cannot do the same with a quark.

The electron is not made of quarks; it is itself an elementary particle. It belongs to another group of six particles called *leptons*. Once again there are three pairs: the electron and the electron neutrino, the *muon* and muon neutrino, and the *tau* and tau neutrino.

Of the six leptons, most atoms contain only electrons, though some radioactive atoms emit neutrinos when they decay. The muon and tau can be thought of as heavy brothers of the electron.

Neutrinos are ghostly particles with no electric charge and little or no mass. They are created in certain types of atomic reactions, such as those that take place in the core of the sun. To use a well-worn astronomical phrase, billions and billions of neutrinos stream out from the sun every second. Though they are very common, they are extremely aloof and very hard to detect. They pass right through normal matter as if is weren't there. Every second during the day, millions of solar neutrinos penetrate your head, exit through the soles of your feet, pass right through the solid earth, emerge from the other side, and keep on going.

So there are six quarks in three pairs and six leptons in three pairs. It's a nice symmetrical arrangement, but why six of each? It's even more puzzling when we consider that to make all the normal matter in the universe only the up and down quarks and the electron and its neutrino are needed.

Besides matter, the universe also contains energy. Energy is manifested through four forces. Two of them are fairly familiar: gravity and electromagnetism. The other two, known as the strong and weak forces, do not directly affect the visible world. Instead, they affect the ways that quarks and leptons interact at close quarters. The strong force is appropriately named, being the most robust of the four forces. However, it operates only over distances on the scale of an atomic nucleus. It confines the quarks inside protons and neutrons, and binds the protons and neutrons together inside atomic nuclei by overcoming the mutual repulsion of the positively charged protons. The weak force operates on the same scale as the strong force, but it is much weaker. It governs certain types of radioactive decay.

Each of these forces is thought to act through carrier particles know as *gauge bosons*. You can compare this to votes at an election. Each person voting is the action that makes the election happen. Similarly, each gauge boson carries its force and makes something happen. The photon is a gauge boson that carries the electromagnetic force. It is best known in the form of visible light.

The weak force has three carriers: the $W+$, $W-$, and Z° bosons. These were first predicted theoretically, and then finally observed in 1983. The strong force has eight carriers which glue quarks together, and hence they are called *gluons*. Like quarks they have been observed only indirectly, but are fairly well established.

Gravity is thought to act through gauge bosons called *gravitons*. As yet these carrier particles have not been observed, but consistency with the other forces would demand their existence.

Therefore there are six leptons,

Quarks are grouped in three pairs.

COURTESY EDMONTON SPACE SCIENCES CENTRE

CERN

In order to study subatomic particles, this machine is used to accelerate the particles to speeds approaching the speed of light.

six quarks, and at least thirteen known or suggested gauge bosons. Furthermore each particle has a complementary anti-particle, with the opposite electric charge. For example, the anti-electron, called a *positron*, has the same mass and size as a normal electron but has a positive rather than a negative charge. And each of the six quarks comes in three "colours." This label has nothing to do with our normal sense of colour, but is another rather capricious term applied to describe a property of quarks that has no everyday parallel.

This is hardly the simple structure of the universe that physicists had hoped to discover. Is there yet another, more fundamental layer of the structure? The answer is yes and no. Quarks and leptons seem to be truly elementary particles. However, physicists believe that these particles evolved out of primordial simplicity.

It has been proposed that under conditions of extremely high energy and density there is only one type of particle and one type of force. Those types of conditions don't exist naturally today, but they did a fraction of a second after the beginning of the universe. They can also be approximated in modern particle accelerators.

The current theory is that quarks, leptons, the four forces, and their bosons crystallized out of the cooling fireball called the Big Bang, the cosmic explosion which marked the birth of our expanding universe. They condensed from pure energy, like snowflakes condensing in a cloud.

There is a lot of good evidence that this is indeed what happened. We can see the universe expanding away from its explosive birth. We can detect the heat left over in the form of cosmic microwaves. And we can study the abundance of primordial material that was created. When we combine this with our knowledge of the present structure of the universe and what we know of the ways in which particles interact, we can work backwards to the Big Bang.

The story that results is not complete but the broad outline is well established. The universe underwent more changes during the first second of its existence than during the fifteen billion years that have followed. Throughout that first second, the four forces crystallized out of the one primordial force and assumed their own identities. Quarks and leptons formed from pure energy, and the quarks clumped together into all the protons and neutrons that exist today.

To fill in all the details would require a description of the laws of

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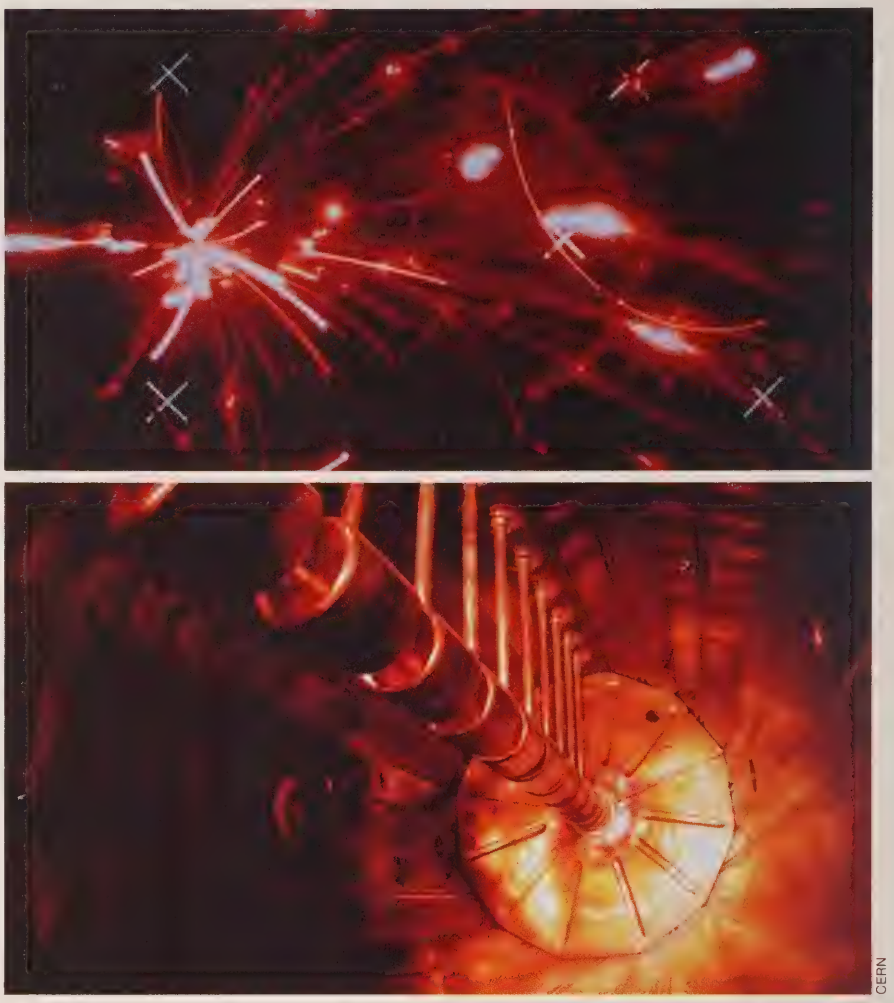

CERN

Top: The W particle, which carries the weak force, was discovered at CERN in this picture of particle tracks. The tracks are the result of a collision of a proton with an anti-proton. *Bottom:* Particle accelerators, the largest machines on earth, are used to study the smallest particles of matter.

nature at the time when the four forces were still unified as a single primordial force. So far theorists have successfully unified the weak and electromagnetic forces into one neat package. Particle accelerators have achieved energies high enough to verify this unification.

Including the strong force and gravity within the theory of a unified force has proven difficult, but some progress has been made. Unfortunately, present particle accelerators cannot achieve high enough energies to test theories which integrate the strong and weak forces. Thus theorists must look for indirect proof.

Some of the Grand Unified Theories predict that protons are not permanently stable, but rather might, over long periods, evaporate. Experimenters are now trying to determine if this is true. If the evaporation of a proton is observed, the theorists will know that they are on the right track. Other scientists look out into space to search for traces of an earlier epoch, when the universe was much different, when the four forces were unified, and when matter and energy were freely interchangeable.

And so it is that the two sciences of particle physics, which studies the smallest bits of matter, and astronomy, which studies the largest structures in the universe, have come together to explain what the universe is made of and how it began.

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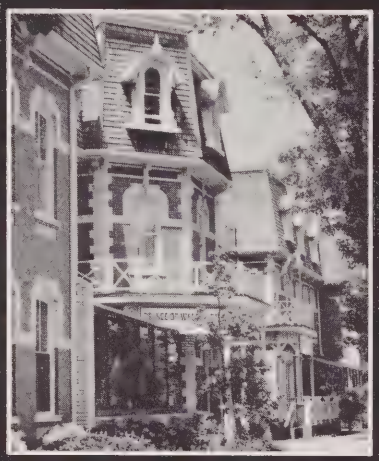

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Dinosaurs, Giants, and Men

Last summer, at the site of a ROM dinosaur excavation in northern Mexico, we had some rather amusing conversations with the local Mexican workers. Our exchanges revealed as much about human nature as the excavation did about dinosaurs.

The people who lived near the site were quite familiar with the large bone fragments that were weathering out of the hillsides, and indeed they were remarkably adept at ferreting out the fragments for us. When asked if they knew the origins of the bones, the locals replied that these were the bones of giants, which they believed still haunted the area today. Although no one had actually seen a living giant, for the Mexicans the occasional disappearance of livestock and the finding of these huge bones were ample proof of their existence.

This story reminded me of others that I had read, and upon my return to Canada I decided to research how various cultures, both past and present, interpreted the bones of extinct animals, especially dinosaurs.

Myths and legends surrounding fossil bones are not only the creations of "unsophisticated" cultures. In the late 1500s in Lucerne, Switzerland, a so-called giant's bones were unearthed and put on display for two centuries before being identified as those of a mammoth. In the 5th century B.C., the Greek historian Herodotus wrote about the excavation of a giant's bones in southern Greece. At that time, these and other finds were thought to be the remains of legendary giants such as Goliath or the cyclops, Polyphemus. Today we can guess that these bones most likely belonged to elephants, since elephant skulls appear to have one large central eye socket, which is actually the nasal sinus.

The Sioux Indians of South Dakota tell the legend of the thunder beast, which during storms supposedly jumped out of the clouds in order to chase herds of buffalo towards the hunters. The bones ascribed to this beast were often washed out of the ground during these storms. O. C. Marsh, the famous American palaeontologist, identified the bones as those of the brontothere, a huge relative of the rhinoceros that lived approximately twenty million years ago. Other Indian tribes created legends about huge fossil tree trunks, which they thought were bones. The Aztecs, when asked by the Spaniards about the builders of their ancient cities, pointed to the fossil bones of elephants, which they thought were the remains of giants.

KEVIN SEYMOUR

A Mexican worker poses next to a dinosaur fossil.

It seems that many legends are tied up with the bones of extinct mammals such as elephants and rhinos. What about dinosaurs? The most tempting legend to try to correlate with dinosaur bones is that of the dragon. The dragon is often reconstructed to look somewhat dinosaurlike and is fairly ubiquitous in Far Eastern cultures as a symbol of good luck. "Dragon" bones are still excavated, sold, and ground for medicinal purposes in China. In fact these bones are largely those of ancient horses, elephants, and sabre cats. The dragon myths are also part of the folklore in many countries where unusually large fossil bones

have not been found. Therefore historians today believe that the myths can be explained without fossil bones as their source. It seems that the idea of giant reptiles never occurred to people before dinosaur fossils were accurately described in the 19th century.

There is a common thread winding through these stories. Regardless of the culture, large fossil bones presented an enigma to people; nothing in their experience could rationally explain where these bones came from. Presented with what was believed to be solid evidence, they all resorted to the fabrication of stories of wondrous mammals or fearful giants.

Back in Mexico, several of the local inhabitants listened attentively to our explanations of dinosaurs and were amazed to discover that their land, which is presently desert, was once lushly vegetated and partly under water. Although these people became minor celebrities in the region because of their new-found knowledge, their giant legend was now discounted.

To compensate for this loss, the Mexicans made us a part of the new local mythology. While our habits, clothing, and language were acceptably foreign to the Mexicans, our request that a fence be built in the middle of "nowhere" to surround our quarry was considered very odd. We only wanted to protect the exposed bones from the hooves of curious cattle; but our workers told the others that the fence was needed to confine the dinosaurs should they come alive during the night. In fact they all knew that this would never happen, but this amusing story about us filled the gap left by the loss of the giant legend.

What does this tell us about the need for myths? Even in our culture we wonder about the stories of Bigfoot, the Loch Ness monster, and UFOs. We all need something intriguing and inexplicable to keep life interesting and mysterious. By making us part of their mythology, the Mexicans demonstrated this beautifully.

KEVIN SEYMOUR

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Charles Trick Currelly

HERO

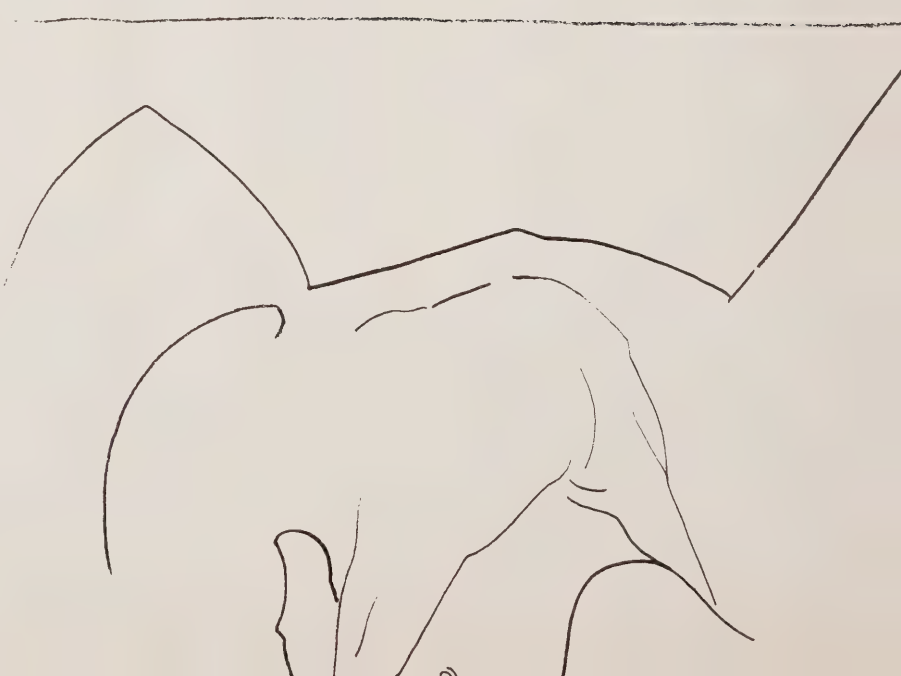
Harold Town

ARTIFACTUAL history is held to the thrusting sweep of time by collectors, that strange compulsive group of acquisitors who cosset, save, and generally squirrel away the "dejectementa" of any given period. Right at this moment, someone must be making a definitive collection of plastic dinosaurs that glow in the dark.

Alexander was a collector of sorts —a great collector. His preference was real estate, and he failed only when he stopped acquiring land and tried to develop his glory.

We all collect something, and even what we collect—collects—dust. Picasso referred to dust as the artist's friend, a strange truth, for dust reduces the destructive elements in light. I suspect that collecting is a Mendelian inheritance and, when considered against how little we started out with in the evolutionary climb from slime, quite understandable.

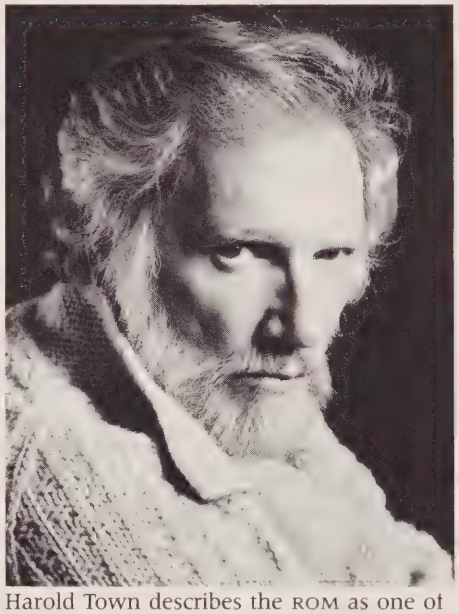
Collecting can be, and often is, a subconscious activity. Many are afflicted by an inability to return beer cases to the warehouse; others



Drawing of C. T. Currelly by Harold Town.

just cannot discard the elastics that hold a head of lettuce together; and think of how many kitchen drawers have been permanently warped by enormous quantities of plastic and paper bags. However, in the long history of collecting—whether by pirate, aesthete, archaeologist, or bag lady—there are divisions of accomplishment: pee-wee collectors, minor-league collectors, semi-pro collectors, professional collectors, and all-star, one-of-a-kind grand acquisitors. Standing high among such magical names as Charles the First, Catherine of Russia, Frick, and Mellon, must be our Charles Trick Currelly, director of the Royal Ontario Museum of Archaeology from 1912 to 1946.

As a public school kid in the depressed '30s, I was introduced to the ROM as part of an odoriferous straggle, a somewhat cleaner than usual, but patched and noisy (though gagged by today's standards), tumult of pre-teens on what was known as a school tour. This exercise in learning was dreaded by the teachers, who drilled us for days before as to our condition, conduct, and deportment. Threatened with reprisals that would stretch on to the summer holidays for any breach of the peace, we boarded streetcars, properly separated from the girls, and made our way to the Museum, swept by the basilisk eye of an educator who counted every snicker as an offence against God.



JOHN REEVES

Harold Town describes the ROM as one of the great loves of his life.

Once at the Museum, having formed a line with the required pushing, and survived yet another lecture on behaviour that included washroom and drinking fountain procedures, we entered as if to a cathedral during high mass. I was instantly transfixed by the mosaic ceiling of the Rotunda, and then stunned into a quiver of expectation by the deadly delights of the Armour Court, now ironically destroyed, proving that the pen of the designer is mightier than the sword. Every bestial atom of my being was sent to charging by the sight of so many weapons of destruction and rapine. Unfortunately the Armour Court was not to be seen; the class was consigned to rocks and the Indian collection. My God! Rocks were what you threw at other kids, squirrels, and anything made of glass; you didn't look at them, you just hoped they were handy. The Indian stuff was better, though short on gore and weapons, and rather heavy on social activity that made one think of homework and cooking utensils. For a kid who grew to love the ROM as a kind of bollard to which I tied my imaginative life, it was not an auspicious beginning to an affair of the heart.

Fortunately, I was saved from the effects of my deadly first encounter with the Museum by a series of gripping radio dramas, broadcast over CRCT under the general title of "Forgotten Footsteps," and based on objects in the ROM collection. "The Trail of the Turtle," derived from portraits of Joseph Brant and Sir William Johnson, featured a brace of pistols which had belonged to Brant and were on display in the Armour Court. I just had to go back; guns had a history. Another drama, "Two Swords of Shardana," took me into prehistoric time, and "The Wassail Bowl" folded in nicely with my love of the Christmas tree. I was hooked; there was more to the Museum than passive Indians and rocks with unpronounceable names.

As a student at the Ontario College of Art, I was required to draw from the Museum collection and to complete specific projects based on particular periods and stylistic phases in history. I barely squeaked by in this course as I was unable to concentrate long enough on any one object to set the detail and the precise shape in place. Art college teacher Frank Carmichael quickly dismissed such drawing by declaring that it belonged in *Esquire*, a remark that I cherished. I continued to whip off drawings and to roam the Museum like a Mogul, sacking objects with my eye, trying to squeeze out the secret of things, feeling about for the apposite place of artifacts in a hierarchical order, looking for the moment when style became custom and custom fell to rote, hunting for the aberration that triggered new style. I had flashes, brittle little intuitions, but my lacunose perceptions brought slight satisfaction; I settled for wonder. The ROM sat in my head like a jail; I knew the inmates but they refused to give up their secrets.

Later, when I was a painter trying to get by in a room the size of a phone booth, an early patron, Professor Bagnani, briefly outlined the evolution of

the ROM and the career of Charles Trick Currelly. I was fascinated and had myself a hero. Centred on a world stage, in a surround of treachery, death, bribery, coincidence, accident, forgery, and derring-do, the extraordinary career of Currelly spotlighted the Museum collection in high relief. Strangely, the heroes of one's youth push into the future and add power to the trajectory of one's life; rather than hold to the past, they model and predict an exciting beginning. I had seen Currelly on two or three occasions at the Museum (once in heated conversation with Bishop White). He was plump and grey, and though his chin featured a Kirk Douglas dimple, he was hardly made to fit the hero's outline. At a distance he seemed avuncular: a man who would sleep with a newspaper on his face, cat upon his lap. But for me he was a hero, and Professor Bagnani's sketch of his life sent me out from my room at the edge of the University to roam the Museum with renewed force.

Then it struck me (none too soon) that the entire collection was a collage, a vast collage; everything overlapped, all the stuff mingled, married, and had offspring. Disparate objects complemented each other, similar things were opposites, and the trite supported the ineffable as spring-boards to a greater glory. Totem poles became rockets of legend aimed at infinity, and armour was an example of man fighting his way back to the wet, dressed as a crab. Savage Chinese demons sweetened into fustian toys, mere lawn ornaments, before the silent terror of the sword, which Currelly felt wrote the history of Europe (death when pointed at you, the cross with blade piercing the earth). Everywhere there were edges, edges, edges, a tiered overlapping of nature, man, and the aspiration of craft, the leaves of history joined to an evolutionary trunk. I had come to a holistic view of art. Nothing was truly separate but everything was different. Modern museum practice puts too much store in precious display, designer colour schemes, theatrical lighting plans, and cute merchandising touches; a museum should be too much, not too little.

I started my first collage and the Museum tumbled out of my head, images were trampled in the rush, and ideas ran amuck. Two of the first collages were titled *Monument to C.T. Currelly,* and the largest was part of the "Five Painters from Canada" group at the 1960 Guggenheim Awards Exhibition in New York.

Still my hero was really just a shade till I read in one sitting his memoir, *I Brought the Ages Home,* which put flesh on a tantalizing armature. What a

ROM ARCHIVES

Charles Trick Currelly, the founder and first director of the Royal Ontario Museum of Archaeology, standing in front of the building.

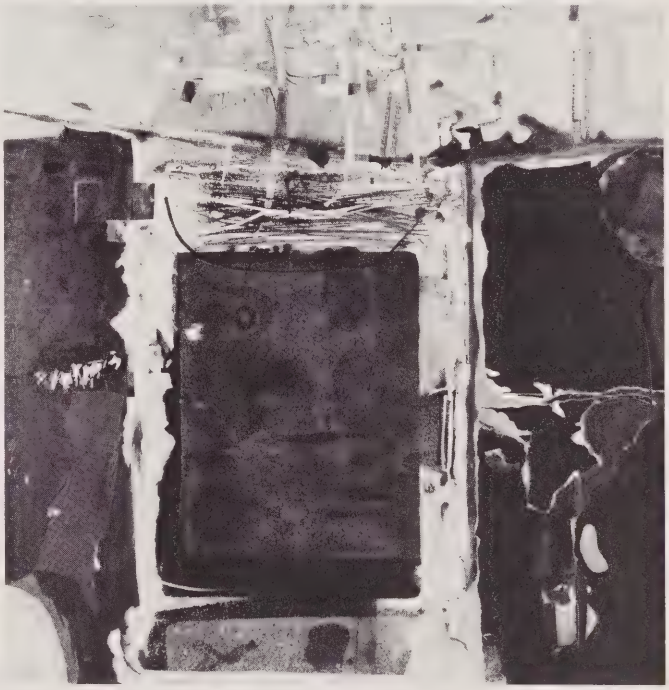


PHOTO VANCOUVER ART GALLERY © HAROLD TOWN

Harold Town, *Monument to C. T. Currelly No. 1,* 1957, collage, 121.9 x 121.9 cm, collection of the Vancouver Art Gallery

ROM ARCHIVES

A drawing by Currelly from one of his notebooks.

remarkable man, and what an extraordinary book. Written with the directness of a bus schedule, totally free of literary affectation, even bland in description, it accounts for a life of scary financial risks, archaeological high adventure, and physical danger, with the simplicity of a note written to the milkman. Nothing seems bloated or pumped up, it is just there on the page, a man who knew what he had to be and what he had to do. Starting with his birth in the Ontario village of Exeter through his time at Harbord Collegiate and Victoria College, on to his days as a pioneering Manitoba missionary, his fateful meeting with Sir William Flinders Petrie, and his adventures in Egypt, Palestine, Syria, Turkey, Crete, Greece, and even El Paso and Santa Fe, there is a sense of predestination and amazing luck.

Currelly's book abounds with the kind of anecdote one hopes for in a celebrity bio and almost never finds. Here is Sir Edward Burne-Jones, on being told by Sir Lawrence Alma Tadema that the tube of paint called mummy brown on his easel was actually made from ground up mummies, calling the maid and proceeding to give the paint a Christian burial in the backyard; and Ruskin, duped by a fraudulent medium into seeing spurious spirits, returning to his recently abandoned religious beliefs and the spiritual values in the work of Tintoretto and other painters—a neat story proving that nothing has changed in the wobbly land of art criticism; and the plaintive question of philanthropic Sir Henry Pellatt to Currelly: "Why didn't you come to see me when I had money?"

However, nothing so typifies the man as the ending of the book that comprises an account of a Mr Dodd finding a Viking sword, axe, and shield boss while hunting for a gold-bearing vein in a strip of white quartz near Port Arthur. The subsequent series of events combines elements of French farce and pulp detective fiction—there is a brakeman who declares the find was a joke; a dead Norwegian who had allegedly brought the weapons from Norway (this claim is denied by the Norwegian consul); a reporter, Jim Curran, of the Sault Ste Marie *Star* who brings the brakeman to Toronto only to have him admit that the Viking objects were not the ones he had seen; and on and on. The story culminates in Currelly stating: "So all the fuss in the newspapers came from the statements of a drunken brakeman and a cellar owner of more than doubtful honesty." He then proceeds to make sensible comments about the damning effect of even one claim of forgery against an artifact, and calls for greater intercommunication of specific knowledge among curatorial agencies before snap judgements are made. Following this he closes the door on his remarkable life, just as if he were leaving the room to pick up the paper from the porch, a fitting end to an uncluttered, even humble, account of a great public career.

Many years later while looking at the sketches in his private journals, I was struck by the similarity, nearly a kinship of many of them, with the drawings of Tom Thomson. Though neither man could be called a draughtsman, there is a peculiar stylistic relationship in their work; the drawing inhabits a lonely space delineated by compulsive lateral pencil strokes.

Though Currelly properly acknowledged Dr George Crofts, the remarkable fur merchant so instrumental in the acquisition of the great Chinese collection, and Sir William Flinders Petrie, his early mentor, along with Sigmund Samuel, the most generous of contributors, and Osler, Mond, Ridgeway, Walker, Bishop White, and others, there can be no question that the permanent beating heart of the collection is Currelly. The Museum is not, as some have suggested, a monument to the man but a muscle, a living organism, the most important single entity in Toronto and a prime factor in the cultural life of Canada.

We name streets, expressways, and concert halls after politicians and businessmen whose accomplishments are as lasting as snow in a blast furnace. Yet the name of Charles Trick Currelly is hardly known in Toronto. Would he care? I think not for I suspect he is somewhere out in the ether soliciting funds for the ultimate museum, the one without walls. ✤

Artist and writer Harold Town is a pre-eminent citizen of Toronto.

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75 ROM

Foxes

A Short Story
by Timothy Findley

The face is only *the thing to write.*

ROLAND BARTHES

WHEN Morris Glendenning first turned up at the Royal Ontario Museum, his unobtrusiveness was quite spectacular. Staff—having been advised the famous communications expert would be spending time doing research in the Far Eastern Department—kept asking one another: "Have you seen him, yet?" and replying: "No." But he was definitely there. Empty chocolate milk containers, brown paper bags, and wads of wax paper thrown into waste baskets verified his presence beyond a doubt. Morris Glendenning's predilection for chocolate milk was part of the media mythology growing like a parasite out of his increasing renown. Besides which, no one in the whole Far Eastern Department had used wax paper to wrap their sandwiches since *Handi-Wrap* had ushered in the millennium.

Morris Glendenning's predilection for chocolate milk was part of the media mythology growing like a parasite out of his increasing renown.

Glendenning was given to wearing old-fashioned galoshes—the kind made of sailcloth and rubber, sporting metal fasteners shaped like little ladders lying on their sides. He was also given to wearing a multiplicity of woollen garments layered across his chest: scarves, sweaters, undervests. And he always wore a navy blue beret, pulled down over the tops of his prominent ears. He was six feet, four inches tall and was made, it seemed, almost entirely of bone. His skin was pale, translucent, and shining—as if he polished it at night with a chamois cloth. Glendenning's overcoat was blue and had a military cut—naval, perhaps. It was pinched at the waist and almost reached his ankles. In magazine photographs—taken always on the run—Morris Glendenning had the look of Greta Garbo, desperate for privacy, heading for doorways and ducking into elevators: *"COMMUNICATIONS EXPERT ESCAPES YET AGAIN!"*

Mrs Elston, in charge of secretarial work for the Far Eastern Department, had been warned Glendenning would turn up first on a Friday morning, the last week in February. She was quite looking forward to meeting the famous man. Dr Dime, the curator, had instructed her to offer all available assistance without stint and without question. On no account, she was told, was he to be approached by staff. "Whatever help he requires, he will solicit: probably by note. . . ." By mid-afternoon, however, on that Friday, Mrs Elston

PHOTOGRAPHY BY JOHN REEVES, JAPANESE THEATRE MASKS FROM THE ROM COLLECTIONS

said: "It doesn't take much to guarantee the privacy of someone who doesn't even bother to show up."

At which point Myrna Stovich, her assistant, said: "But he *is* here, Mrs Elston. Or—someone is. His overcoat and galoshes are sitting right there. . . ." And she pointed out a huddled, blue cloth shape on a chair and a pair of weeping overshoes squatting in a large brown puddle.

"For heavens' sake," said Mrs Elston. "How can that have happened when I've been sitting here all day?"

"Except when you went for your lunch," said Myrna Stovich. "Also, maybe except when you went to the loo."

"Someone has been on duty here, Myrna—you or me or someone—every minute. This office is never deserted. Never."

"Well—he got in here somehow without our knowing."

"Yes," said Mrs Elston. "And, it seems, is still with us."

"But *where* . . .?" said Myrna Stovich.

The night before, and all that morning, it had snowed. The clouds were a shade of blue-grey flannel peculiar to clouds that lower above Toronto at the dirty end of winter. Looking at them made you cough. Morris Glendenning had supplemented his already over-protective array of woollen garments with one more scarf, which he pulled down crossways over his radiator ribs and tied against the small of his back. Even before he departed his Rosedale home, he pulled his beret over his ears and bowed his head beneath the elements.

The clouds were a shade of blue-grey flannel peculiar to clouds that lower above Toronto at the dirty end of winter. Looking at them made you cough.

Walking across the Sherbourne Street bridge, Morris set his mind on his destination and thereby shut out the presence of his fellow pedestrians. His destination at large was the Royal Ontario Museum but his absolute destination was its collection of Japanese theatre masks.

Long after midnight, Morris Glendenning had sat up watching the snow eradicate the garden and the trees beyond his windows. Now, he was tired. And reflective. Progress with his current work had stalled, partly due to the residue of sorrow over his wife's midsummer death and partly due to the fact he had published a book two months later, in September. The work itself—the massing of materials, the culling of ideas—had been passing through an arid stage and it was only in the last few days that he'd begun to feel remotely creative again. Not that he hadn't traversed this particular desert before. Far from it. After every piece of exploration—after every publication of his findings—after every attempt at articulating the theories rising from his findings—Morris Glendenning—not unlike every other kind of writer—found himself, as if by some sinister miracle of transportation, not at the edge but at the very centre of a wasteland from which he could extract not a single living thought. For days—sometimes for weeks—his mind had all the symptoms of dehydration and starvation: desiccated and paralysed almost to the point of catatonia. Five days ago it had been in that state. But, now, it was reviving—feeding again—but gently. And all because of a chance encounter with a photograph.

The photograph had appeared in a magazine called *Rotunda*, published by the Royal Ontario Museum, and it showed a Japanese theatre mask recently purchased and brought from the Orient. "Fox," the caption read. But it wasn't quite a fox. It was a *human fox*, alarming in its subtle implications. Reading about it, Morris Glendenning discovered it was one of three or four others—a series of masks created for a 17th-century Japanese drama in which a fox becomes a man. Each of the masks, so the article informed him, displayed a separate stage in the transformation of a quintessential fox into a quintessential human being. Glendenning's curiosity was piqued—and more than piqued; a trigger was pulled in the depths of his consciousness. Something had been recognized, he realized, and he felt the reverberations rising like bubbles to the surface: signals, perhaps—or warnings.

He very well remembered reading David Garnett's horror story *Lady Into Fox*—that masterful, witty morality tale in which the English "hunting class" is put in its place when one of its wives becomes a fox. But here, in these Japanese masks, the process had been reversed. It was the fox who took on human form. On the other hand, this was more or less standard procedure when it came to balancing the myths and customs of the Orient against the myths and customs of the West. Almost inevitably, the icons and symbols employed by custom and by myth were

opposites: white in the Orient, black in the West for mourning; respect for, not the arrogation of nature; birth not death as access to immortality.

Whose fate, Glendenning had written in the margin next to the photograph, *is being fulfilled within this mask? The fox's? Or the man's?*

Clipping the whole page out of the magazine, he slipped it into a file marked *Personae* and, five minutes later, retrieved it—held it up in the snow-white light from the windows and stared at it, mesmerized. The question became an obsession. Looking into the lacquered face of the mask he imagined stripping off the layers of the human face. Not to the bone, but to the being.

The blooming of the image took its time: it occurred to him slowly that under the weight of all his personal masks, there was a being that he had never seen. Not a creature hidden by design—but something buried alive that wanted to live and had a right to life.

Foxes into humans: *their choice, not ours.*

Standing in the bathroom, later that afternoon, something sent a shudder through his shoulders and down his back when, in the very instant of switching on the light and turning to face himself—he caught the presence of his unmasked self in the mirror. And he noted, in that prodding ever-observant part of his brain—where even the death of his wife had been observed with the keenest objectivity—that what had been unmasked had not been human. What he had seen—and all he had seen—was a pair of pale gold eyes that stared from a surround of darkness he could not identify.

Half-an-hour later, having waited until he knew he stood some chance of sounding like himself, Morris had picked up the telephone and placed a call to his old acquaintance, Harry Dime, who was curator of the Far Eastern Department at the Royal Ontario Museum. What privileges could Dime afford him?

Could he inspect the masks alone?

Dime would later conclude he should have said no. For all his own awareness of intellectual curiosity and for all his own sense of daring, he had no sense at all of the dangerous threshold at which Glendenning stood. Dime had forgotten—or perhaps had

never known—that when he returned in triumph with his treasures from another time and place, he brought them with all their magic intact. Not spells, of course, since we live in a civilized age—but the magic they released in others: in those who beheld them without the falderal of fear.

On that snowy Friday morning, Morris Glendenning debated whether to walk or to chance the streetcar. Chancing the streetcar might mean recognition and, given the burden of interruption that recognition so often produced, he walked.

Bloor Street on a Friday is clotted with shoppers—most of them, Morris noted—giving the appearance of worldly-wise indifference: "*I could go in and buy that coat if I wanted to,*" they seemed to be telling themselves. "*But I won't. I'll do that tomorrow: maybe Monday. . . .*"

Today, this almost eerie impassivity troubled Morris Glendenning. The street, for all its mass of people and traffic, was strangely silent beneath the falling snow. He perceived, as he watched, a kind of debilitating apartness that, once, had been entirely foreign to these people. And he knew these people well: none, in fact, better. They were his own and he knew their feet had carried them through every kind of weather. They lived, after all, in a northern clime. Their bodies and their minds had weathered every kind of crisis a human being encounters. He knew their eyes had stared down every kind of storm—just as his own had, walking in their company. Yet, now, he perceived they were strangers to him: suddenly—strangers.

Why were they so unconcerned with one another?

When had they become collectively impassive?

It affected everything they did—he observed—this intractable indifference. It affected the way they walked—the speed with which they walked—their gait, as they made their way along the street. They moved, Morris thought—gazing at them through the falling snow—with the kind of apathy acquired by those whom something—bitterness?—has taught that nothing waits for those who hurry home. It came to him slowly, standing on the curb at Avenue Road and Bloor, that, when he rode on streetcars and was recognized, it was not their recognition of him that mattered: but their hope that he—in all his ballyhooed wisdom—might recognize them and tell them who they were. *I know you from somewhere: that's what they yearned for him to say. I know—I recognize who you are.*

I know you from somewhere: *that's what they yearned for him to say.* I know—I recognize who you are.

In the cellars at the ROM, there is a labyrinth of halls and passageways that leads, through various degrees of light and temperature, to various sequestered rooms where various treasures lie in wait for someone to come and give them back their meaning. Bits and pieces, shards and corners of time—numbered, catalogued, guessed at.

Morris Glendenning stood in one of these rooms—perspiring, it so happened—holding in his fingers—his fingers encased in white cotton gloves—the very mask he had encountered first in its photographed image.

The door behind him was closed.

The room—effectively—was sound-proofed by its very depth in the cellars and its distance from the active centre of the building. A dread, white light was all he had to see by: "daylight" shining from computerized bulbs.

The mask's companions—three in number—were set out, sterile on a sterile tray: the fox on its way to becoming a man.

He thought of surgery.

He thought of layers.

How small, he thought; *the face is.*

Looking down, beyond the mask he held, at the others, he counted over the variations and degrees of change—the fox in his hands at one extreme and the others, lying on their tray, burgeoning feature by feature into a close proximity of Oriental human beauty. The widely tilted, oval eyes of the fox became the evenly centred, almond eyes of a man. Of a *priest,*

so the collections catalogue had told him.

A priest. So apt a designation, it could only be amusing. Though amusing, of course, in a sinister way.

Morris felt like a marauding and possibly destructive child bent on mischief. A vandal, perhaps. Most certainly, he knew he was trespassing here, the victim of an irresistible impulse: *put it on . . . .*

He had spent over three hours standing there, touching — lifting — contemplating the masks. Around him, resting on shelves and laid out, numbered in other sterile trays, was the department's whole collection of Japanese theatre masks. Each mask was hidden: slung in a silk and sometimes quite elaborate bag, the drawstrings tied in neat, fastidious bows.

Heads, he thought. *The victims of some revolution.*

The truth was—he dared not open the bags to look.

Some of the bags were darkly stained. And, even though he fully recognized the stains were merely of time and of mildew, he could not bring himself to touch.

Put it on. Don't be afraid.

Go on.

He held the mask up gently before his face.

He could smell its . . . what? Its mustiness?

Or was it muskiness?

He closed his eyes and fitted the moulded inner surface over the contours of his bones.

He waited fully fifteen seconds before he dared to open his eyes.

The masks below him, sitting on their tray, were smiling.

Had they smiled before?

He waited, knowing he must not give up until the whole sensation of the mask had been experienced—no matter how long it took.

Somewhere out in the corridor, he thought he heard a noise. The voice of someone calling.

He held his breath, in order to hear the better.

Nothing.

And then—just as he began to breathe again—he felt the vibrations of a sound between his face and the mask.

What was it?

Another voice.

But whose?

His own.

He was a long way off inside himself and standing in another light. A pattern of leaves threw shadows over what he saw: perhaps the verge of a clearing somewhere.

Creatures—not human—moved before him.

Foxes.

How elegant they were. How delicate, precise, and knowing . . . .

Why was he so unconcerned and unafraid?

He began to receive the scent of earth as he had never smelled the earth before: a safe, green, sunwarmed scent.

He looked at his hands. He held them out as far as he could. Human hands—white—he could not recognize.

He tried to speak, but could not.

What emerged, instead of speech, was song.

Down below him, where the earth replaced the floor, one of the foxes came and sat at his feet and stared up into his face.

Morris Glendenning shuddered.

All the foxes were coming, one by one, to sing with him. They leaned against his legs. He could feel their bones against his shins.

Morris tore the mask from his face and threw it down towards them on the floor.

He who wears the mask is he who is.

He would never dare again to pursue that thought. He would rather walk forever, safe with the others in the streets—apparently indifferent—but knowing now for certain—why it was he dared not look them in the eye. There was reason, after all, to hide.

Just before five that afternoon, Mrs Elston was putting the cover on her IBM and preparing to leave, when she became aware all at once of someone standing behind her.

"Oh," she said—recovering as best she could. "We thought you were not here, Professor Glendenning."

His enormous height was bending to the task of pulling on his galoshes.

"Shall we be seeing you tomorrow?" Mrs Elston asked.

He shook his head.

"The next day, perhaps."

But he had turned away: silent.

He drew his many scarves about him, buttoned his greatcoat, took up his leather bag, and started away.

"But, Professor Glendenning. . . ."

Mrs Elston could not reach him. He was gone.

The door swung to and fro.

Mrs Elston sniffed the air.

"Myrna?" she said. "Do you smell something?"

But Myrna Stovich needed no prompting.

"Sure," she said. "Dog."

"But there can't be a dog!" said Mrs Elston.

"Well—we also thought there wasn't Professor Glendenning, didn't we?"

Mrs Elston laughed.

"What a day!" she said. "And now we have to go out into the snow."

"I like the snow," said Myrna Stovich.

"Yes, I like it, too," said Mrs Elston. "Seeing it's what we've got."

Timothy Findley was born in Toronto and now lives in the country nearby. His novel The Wars *was a winner of the Governor-General's Award. Mr Findley was made an Officer of the Order of Canada in 1986.*

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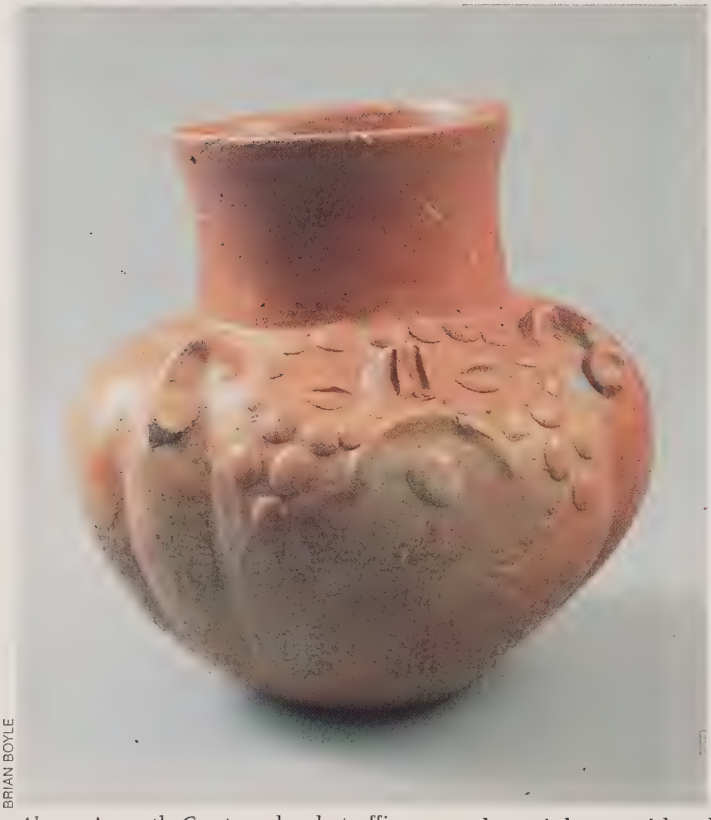
THE ROM'S MARCO GONZALEZ EXCAVATIONS IN BELIZE

Even the smallest site can provide missing links in the Maya past.

David M. Pendergast
and Elizabeth Graham



BRIAN BOYLE

Above: A north Guatemalan bat effigy jar, 14 cm high, from a 10th-century burial at the ROM Marco Gonzalez site in Belize. The bat was a Maya god.

Opposite page: Pottery head of a god (or a human being); decoration from a 15th- or 16th-century bowl.

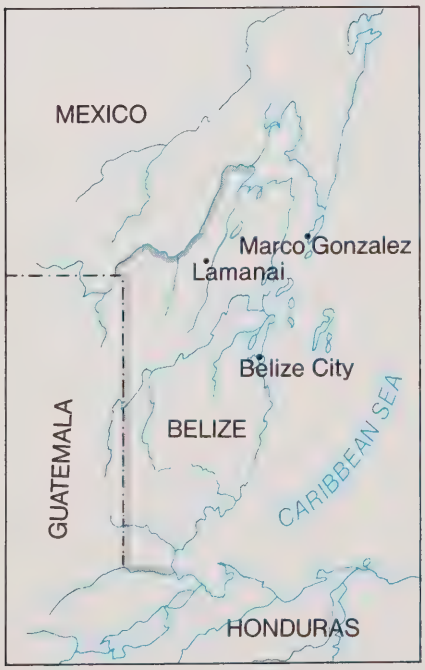
A glance at the map of Belize shows that it is a very long jump indeed from the ROM's excavations at Lamanai to the southern tip of Ambergris Cay, one of the coral islands that dot the country's famous barrier reef. If we were to seek further light on ancient Maya life as we know it from the Museum's thirteen-year project at Lamanai, the tiny Marco Gonzalez site, set in what is now uninhabited mangrove swamp some 182 kilometres by river and sea from the great centre, might seem the least likely target for investigation. Yet work at the little swamp-bound community in April and May of 1986 has shown that distance was no barrier to the ancient Maya; for at least part of their long histories, the two sites were very closely linked.

Unlike Lamanai, the little island site has not retained its ancient name, so we named the place after the fourteen-year-old boy who led us there in 1984. Marco boasts to his friends that he is the only person in the town of San Pedro who has a site named after him; true, but he got a lot of laughs around the town when we wrote in the local newspaper (the *Coconut Wireless*) about digging Marco Gonzalez. We spent five weeks clearing bush and digging, with just six Maya excavators plus Claude Bélanger as architect/mapper and Cathy Yasui as faunal analyst and excavator; in that time we examined almost one-fourth of the site's forty-five structures, most of which stand on a small island of elevated ground in a sea of mangrove.

Though the elevated land has long been used as a coconut plantation, it also boasts a profusion of gumbo-limbo trees, with their shiny brown peeling bark, and *chechem*, or white poisonwood, which exudes a sticky brown sap that attacks one's skin like a tropical version of poison ivy. Beneath the trees, the underbrush and the mosquito population would give pause to anyone who might consider the spot as a living site. Why, then, did the Maya choose the place for what we now know was an important settlement, far above the level of a simple offshore fishing village?

Part of the answer to this puzzling question was provided by our chance meeting with Drs S. J. Mazzullo and Al Reid, Texas geologists who have been studying Ambergris Cay for several years. Their research indicates that sea level has risen about sixty centimetres in the past two thousand years, accom-

Pottery dating from the 12th century and later, and stone and shell artifacts are displayed on a makeshift table in the project "laboratory."



panied by accretion of the windward side of the cay. Excavation showed that the earliest construction in Marco Gonzalez's centre, an extensive floor, is likely to be about two thousand years old; though it lies today immediately above the water table, the floor sits on top of at least seventy-seven centimetres of building stone.

The site was clearly higher, drier, more open to windward breezes, and hence considerably more attractive to human settlement two millennia ago than it is today. Mangrove stands were restricted then, as they are now, to areas of seasonal or year-round inundation. This left the area for homes open to invasion in ancient times by other kinds of plants, such as those that grow in beach sand, or even by deciduous fruit trees whose seeds took root in the humus created from debris that had accumulated over the years.

From its initial settlement just before the beginning of the Christian Era, Marco Gonzalez was occupied for almost seventeen hundred years. The latest people we know about may in fact have been on the cay when the Spaniards entered what is now Belize in 1544; if so, they were surely witnesses to the decline that followed what appear to have been the community's peak years, from about A.D. 1150 to 1300. It was during the peak years that Marco Gonzalez enjoyed close ties with Lamanai, and it is precisely here that the site sheds major new light on the Maya past.

Though Marco Gonzalez's people seem to have been engaged in fishing and shellfish collection throughout the community's history, the site unquestionably had more than food-gathering importance in the 12th and 13th centuries. Its location at the tip of the cay, where inhabitants could have watched over canoe traffic along the island's leeward shore, may have given Marco Gonzalez a role in the control of waterborne commerce. It may also have made the link with Lamanai a logical one; once into the leeward waters, traders and other travellers were on their way to the mouth of the New River, or Dzuluinicob as it was known in ancient times, that great highway to the interior—to Lamanai and the lands beyond.

It was pottery that first told us of the link with Lamanai when we visited the site in 1984, and it is pottery that documents Marco Gonzalez's wealth

Elizabeth Graham excavates a low platform made from thousands of conch shells.

and importance in the years between 1150 and 1300. Every building examined, whether in excavation or during mapping, yielded pottery fragments from this period; from some buildings, the quantities of pottery per cubic metre actually exceeded those at Lamanai itself. In these years, and perhaps earlier as well, the townspeople of Marco Gonzalez obviously enjoyed as great a variety, quantity, and quality of pottery, and other goods, as did Lamanai's city dwellers.

All of this evidence comes from very unprepossessing sources. None of the buildings at Marco Gonzalez is more than a platform of earth, shells, and occasional stone, faced with reefstone blocks. It is hard to envision the platforms topped by the thatched houses that postholes and pits in floors tell us once were there, and harder still to see the mangrove-ringed group of mounds as part of a larger beachfront community that may have numbered eight hundred souls or more. But from refuse around the platforms, as well as burials, offerings, and pottery fragments found within the buildings, we have begun to develop a picture of life in the community many centuries ago. The life was a rich one; though Marco Gonzalez was of village size, it enjoyed a level of activity and wealth that must have created the semblance of a small town.

The ties with Lamanai, probably the most important facet of the town's 12th- and 13th-century existence, seem to have involved shared preferences in the way pottery was made and used, rather than trade in the pots themselves. Though few clay sources are known on Ambergris Cay, and only one may have material suitable for potting, the immense quantities of sherds at the site suggest that vessels were made locally.

Marco Gonzalez's potters adopted many of the forms of Lamanai vessels and some of the decoration, but often executed the vessels in sizes unknown at the great city, and with motifs that no Lamanai citizen had ever seen. This

suggests that the town enjoyed some independence despite its position within what might be called a Lamanai sphere of influence. In this sense the distance between the two sites may indeed have been a bit of a barrier, which lent Marco Gonzalez a status somewhat above that of a vassal village.

Besides the Lamanai link, the town enjoyed commercial ties with many other parts of ancient Mesoamerica. The shape and decoration of some pottery fragments tell us that the community was in touch with pottery-making centres in the northern part of the Yucatan Peninsula; a beautiful bat-effigy vessel, recovered intact from the grave of a middle-aged woman, speaks of trade with the northern highlands of Guatemala in the 10th or 11th century.

The ware of the bat effigy, known as plumbate, seems to have caught the fancy of almost every lowland Maya, and many peoples farther north in Mesoamerica, just before Marco Gonzalez's peak years began. However, the bat vessel itself has few counterparts. Only four similar jars have been reported: one was found at Copan, in Honduras, and the other three come from more distant sites in central Mexico, southern Mexico, and El Salvador. Together with grey obsidian from highland Guatemala and a highly distinctive green variety from the Valley of Mexico, almost thirteen hundred kilometres to the north, the plumbate jar shows that Marco Gonzalez's seemingly out-of-the-way location did not isolate the community from the great Mesoamerican commerical flow during the period of A.D. 1150 to 1300, and earlier times.

A large jade celt provides further evidence of trade. The celt, which is partly carved into human form, was found at the top of one of the site's larger buildings. Here, as elsewhere, luck was on our side; if it had not been for a gumbolimbo root, looters who attacked the building's front stair would have found the jade, and a small pot that accompanied it, and knowledge of the site's past would have been significantly diminished. We can only guess at what the clandestine diggers found in the stair itself; evidence suggests that they may have stumbled on other elaborate artifacts placed in the building in the 16th century.

Apart from these and other insights into life on Ambergris Cay over a seventeen-hundred-year span, what have the excavations at Marco Gonzalez told us about the ancient Maya? Before masses of the material began to pour from our cay excavations, bits of Lamanai-style pottery were known from just three other sites: Altun Ha, Mayflower in the southern part of Belize, and Tipu, on the country's western border. Only from the last of these had such pottery come from refuse heaps and the core of buildings; at the other two, the material had been deposited on the surfaces of ruined structures. Now we can see what logic told us must have been true: besides Lamanai, at least one other

David Pendergast *(left)* and Claude Bélanger *(right)* clean a jade celt found beneath a gumbolimbo root.

An excavator struggles with the gumbo-limbo root that luckily concealed from looters the large jade celt.

community in northern Belize, and probably a good many others, survived the disintegration of Maya society around A.D. 900 and flourished in the centuries thereafter.

Though the discovery of so much information about Marco Gonzalez after A.D. 900 was exciting, the material from earlier times proved intriguing as well. From about A.D. 600 to 900, the site seems to have been a focus of some sort of intensive processing activity, very likely the production of salt from seawater; the debris from the processing lies in stratified deposits that in places are well over a metre deep. Below the deposits lie remains from earlier times, extending back to at least 200 B.C. Much of the material is submerged in salt water, and therefore difficult to retrieve. Here, as elsewhere along Belize's coast, the rising sea has left us with little information on early Maya life.

The 1986 excavations were only a probe into Marco Gonzalez's past. We hope to be able to return to the site in the near future to wrest the remainder of the data from the ground before further looters' attacks deprive us of even more critical information. Marco Gonzalez is a perfect example of the potential importance of even the tiniest and most peripheral site to our understanding of the past; here, too, we can see the drastic effects of looting, even though monetary gain would be small or nil.

Claude Bélanger *(left)* and Cathy Yasui *(right)* check a metre-thick bed of fine strata that were probably related to salt production at Marco Gonzalez.

A looter who searches Marco Gonzalez for a royal tomb is almost surely on a fool's errand, for the site was a town, not a great city-state, and its king's palace stood somewhere far away from the south end of Ambergris Cay. Yet for us the site is filled with insights into prehistory, often contained in seemingly insignificant objects and fragments. Perhaps because the site is so small, the sense of the fragility of the archaeological record under the threat of looters' avarice is even stronger here than at major centres such as Lamanai. Nearly one-quarter of Marco Gonzalez's buildings have already suffered some damage; with relatively little effort, clandestine diggers could almost literally wipe the site from the face of the earth.

We can only hope that budding local interest in preserving the site, coupled with a scheme to include the community within a nature reserve, will hold Marco Gonzalez together until we can find a way to return to complete the work. In ways more far-reaching than we could have anticipated, the excavations have already altered our perception of Maya prehistory; they will surely also begin soon to shape the efforts of others who seek to turn our present patchwork of knowledge into a real tapestry of ancient Maya life in the centuries before the arrival of the Spaniards.

David M. Pendergast is curator in charge of the Department of New World Archaeology, ROM, and Elizabeth Graham is a research associate in the department.

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Fulfilling the Promise of Beauty Through Sande

Child into Woman

The secret Sande society of the Mende tribes is unique in Africa because of the personal adornment worn during the rituals to mark the passage from childhood to womanhood.

Ruth Phillips

THE transition from childhood to womanhood is one that every society marks with its own distinct rituals. For at least the past four hundred years among the Mende of Sierra Leone, this transition has been choreographed by an organization called Sande, an exclusively female group to which all Mende women must belong in order to attain full adult status in the community. Initiation into Sande is necessary to accomplish the mysterious transformation of a neutral, sexless child into a competent and aware female, ready to marry and to bear children of her own. The outer sign of this momentous transformation is the acquisition of a cultivated, mature beauty visible in the woman's grooming, dress, and bearing.

A Mende woman looks back upon the rites of puberty as the most important time in her life. As a child she had been a relatively insignificant person, expected to work hard by the relatives to whom she had been sent for training, and often receiving little of the available food and clothing. After marriage and the birth of her own children, she will again be expected to express modesty and restraint in her manner and dress. At the end of her initiation into Sande, however, when a girl first achieves full womanhood, she becomes, for a brief moment, the focus of the attention and admiration of the whole community. At the celebration which marks the completion of Sande initiation, each young woman is presented to the community to be fêted and lavished with gifts.

Sande achieves its goal because of the powerful medicine that the society controls. This medicine, like the activities of Sande in general, is carefully guarded from the eyes of the uninitiated. However, there is a public manifestation of the Sande medicine: a masked woman called *sowei*, who impersonates the female river spirit that lends Sande its power. The *sowei* mask has been of special interest to students of African art because, to the best of their knowledge, it is the only mask entirely controlled and worn by women; elsewhere in Africa, masks representing women are actually worn by men. The unusual

Opposite page: A *sowei* mask from Gbengbema village, Moyamba district, in central Mendeland. The classical Mende notion of female beauty is typified by the downcast eyes, closed mouth, high rounded forehead, and ringed neck. The elaborate hairstyle is a mark of high social status as well as of beauty. This particular style has been popular since the 1930s.

MARK PHILLIPS

Above: A young Mende girl before Sande initiation.
Right: The *sowei* masker dancing at Ngiyehun village, Kailahun chiefdom, in eastern Mendeland, in 1972. The masker's movements are lively, quick, and often abrupt in order to demonstrate her non-human, supernatural power. In contrast, the dances taught to Sande initiates are slow and graceful.

control over female masks among the Mende is the mirror of the control that women exercise over their own behaviour and social role through Sande itself. The mask is also of great interest because it embodies the Mende notion of female beauty and is thus the ideal on which the young initiates model themselves. The *sowei* masker (the woman impersonating the river spirit) has often been referred to as the tutorial spirit of Sande because of her close association with the initiation process. The link between the form of the mask and the personal adornment of the young women after Sande initiation is interesting to explore.

The outfit worn by the *sowei* masker contrasts greatly with those worn by the maskers of other important Mende secret societies. The *sowei* masker is dressed entirely in black from her raffia capes and clothes to her shining black-stained helmet mask, for black is the colour of the river waters where the *sowei* spirit dwells. Other Mende maskers wear capes of white, undyed raffia suggestive of the forest and bush. The *sowei* headpiece or mask, which is carved in the image of a beautiful woman of high rank, is the most striking part of the costume. It has an elaborate coiffure in a style that would be worn by women from rich and powerful families. The face is small, refined, and deli-

Sande society officials, *sowei* maskers, and Sande initiates celebrate the emergence of the initiates from their period of seclusion. This ceremony took place in 1972, in Bandajuma Kovegbuami village, Kenema district, in eastern Mendeland. Whenever possible, many *sowei* maskers dance at Sande celebrations in order to augment the beauty and joy of the occasion.

cately carved with a small, closed mouth and downcast eyes. The mask's neck, which is wide enough to allow the mask to fit over the wearer's head, is ringed to represent the lines of the human neck, which are considered a sign of great beauty by the Mende. Often carved representations of very costly magical amulets are incorporated in the mask to emphasize power and wealth. One or more *sowei* maskers are often among the girls during the private initiation sessions, and they appear with the young women when they are presented to the community at key moments during the initiation period.

Sande initiation takes place in a fenced enclosure outside the village known as the Sande bush. Every village has its own chapter of Sande and, once initiated, women retain their membership throughout life. In the past, Sande initiation took place over a period of three or four years, beginning ideally at the onset of puberty and lasting until the young women completed their training and were ready to be married. Marriage followed very soon after, and an acknowledged purpose of the long period of initiation was to guarantee the virginity of young girls for their future husbands. The period is now often shortened to six months or less to coincide with school vacations because many of the participants are schoolgirls.

The first act of initiation is the excision of a part of the clitoris. This act, like circumcision, has been interpreted as rendering the sexually neutral child entirely male or female by ritually removing that part which properly belongs to the opposite sex. Girls remain secluded in the bush until they have healed, and the trauma and the danger of infection resulting from the operation make the time an anxious one for their waiting families. The first emergence from the bush is, accordingly, a time of restrained celebration during which a village dance is held.

Changes in dress and body decoration are extremely important signs of the different phases of initiation. As the girls enter the village for the first time, the change in their status is dramatically marked by their distinctive garments and ornaments: they wear headties tied in a special way around their waists, a leopard's tooth as a traditional sign of high birth, and heavy ropes made of many strands of beads around their necks and across their chests. Their bodies are covered with a white clay called *wojeh*, a substance often mixed with medicines and applied to cool and heal sickness. This clay is rubbed on the skin throughout the time that they are Sande initiates, symbolizing the protective medicinal power. The special combination of costume and *wojeh* acts as a powerful deterrent to any man tempted to interfere with a Sande initiate,

In Tiso village, Kenema district, in eastern Mendeland, in 1972, the procession of a *sowei* masker, Sande officials, and a new member of Sande returns from the private, riverside washing ceremony.

immediately warning him that any unlawful contact would result in his suffering the harmful effects of the medicine.

The whitening of the skin may have further significance. Whiteness is the colour of the spirit world—the direct opposite of the glowing blackness of the skin of living people and of the *sowei* masker. When girls are initiated into Sande, they are removed from the world of ordinary people into a liminal state where they encounter supernatural forces. Their previous childhood identity is quenched and they receive new names. The whiteness of the skin is a sign of this transitional state of being. Photographs of Sande initiates taken early in the century show a variety of body ornaments worn together with the white clay. In an early photograph taken in the 1930s one girl wears a fringe over her face to ensure modesty. In recent years ropes of colourful glass beads have replaced those made of natural materials; however, their general arrangement remains the same. These ornaments retain great meaning for Sande members and are treasured throughout life.

During the initiation period, the young girls are instructed by the senior Sande leaders, who are older women skilled in crafts, dancing, and singing, and wise in the mysteries of sexuality, childbirth, and child-rearing. Special aptitudes among the initiates, particularly as performers, are also noted and developed. The dancing and singing performed by the Sande initiates are a special delight to the public. The initiates are said to be the most graceful and lovely dancers in the community, and traditionally a performance by Sande girls was the finest entertainment a chief could arrange for visitors. In the accomplishments expected of young women, grace and beauty as embodied in song and dance rank alongside more practical skills and knowledge.

The last of the great Sande celebrations is commonly known as the pulling from Sande. The girls appear in the village coated in *wojeh* and dressed in white garments that distinguish them from the crowd of onlookers. When payments and arrangements for their release from Sande are complete, they withdraw to the river edge with the Sande officials. Here the ritual of washing takes place. The special protection of the Sande medicine is removed, for now, fully prepared by the teaching they have received, they are capable of comporting themselves as adults.

The young women return from the river in a procession that is truly triumphant. Formerly it was common for them to walk under a canopy of valuable, finely woven country cloths, and this custom is still followed in some villages although umbrellas have been substituted in most places. But it is the physical splendour of the young women that is most dramatic. All through the period of their initiation they have eaten very well, far better than they had been accustomed to do. As Sylvia Boone has pointed out in her recent book *Radiance from the Waters: Ideals of Feminine Beauty in Mende Art*, to the Mende there is

As the major project to celebrate its 75th Anniversary, the Royal Ontario Museum presents Eye of the Beholder: Objects for Personal Adornment *from 11 April to 30 August 1987. This exhibition has been made possible by the sponsorship of Magna International Inc., A Fair Enterprise Corporation and the generous support of the Ontario Ministry of Citizenship and Culture, the Honourable Lily Munro, minister; and the Government of Canada, Department of Communications, the Honourable Flora MacDonald, minister.*

FROM WESTAFRIKAS LETZTES RATSEL (1936)

A Sande initiate in ceremonial dress, circa 1936. Her veil is made of small wooden sticks, and the three leopard teeth worn at her waist are ancient symbols of free-born individuals of high social rank.

a widely understood equation between plumpness and beauty on one side and health, prosperity, and fertility on the other. To further emphasize the health and readiness of the young women, their skins are rubbed with oil; the contrast to the chalky whiteness of the initiate's clay-daubed skin could not be more striking. The lustrous darkness of their skin now resembles the glossy surface of the *sowei* mask, just as their rounded bodies echo the full volumes of the mask image. They have learned to carry themselves with grace, and to wear the composed, self-contained expression characteristic of the faces of the masks, which is consistent with the Mende idea of elegance. The clothing worn by the young women is as new as their adulthood. An abundance of *lapas* or lengths of valuable trade cloth is traditionally worn; however, some women now wear Western dresses and high-heeled shoes. At one time, all of the family silver jewellery was heaped on the Sande graduate during her glorious celebration.

The Sande has adapted in many ways to the pressures of modernization, while continuing to teach traditional values central to successful marriage and family life. It is not surprising that membership continues to be an essential part of a Mende girl's preparation for adult life.

Ruth Phillips is an associate professor in the Department of Art History, Carleton University, Ottawa. She conducted fieldwork in Sierra Leone in 1972 for her doctoral thesis. Dr Phillips is currently studying the art of the Woodland Indians of Canada.

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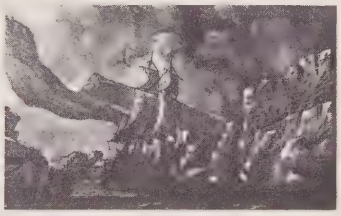

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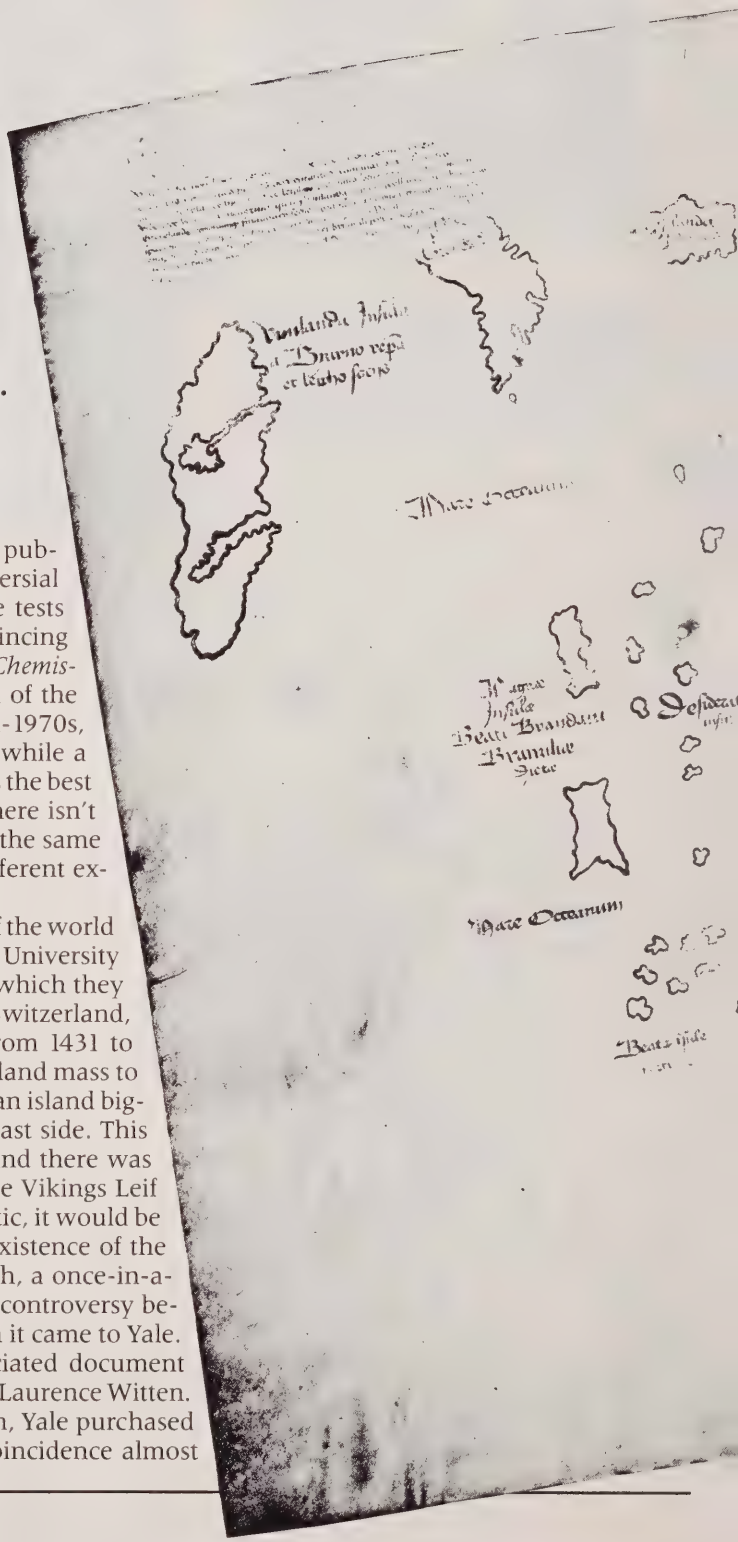
THE VINLAND

Does science always present the truth? Attempts to authenticate Yale University's Vinland Map have raised serious doubts about the objectivity of scientific research.

Jay Ingram



THE scientific journal *Analytical Chemistry* has just published the results of a new set of tests on a controversial piece of parchment called the Vinland Map. The tests show that, contrary to widespread belief, there is no convincing scientific evidence that the map is a fake. The *Analytical Chemistry* report will certainly raise questions about the work of the scientists who did claim the map was a forgery in the mid-1970s, but more important, it should remind us that science, while a powerful method for learning about nature, is not always the best way to resolve controversies. It proves the point that there isn't just one scientific truth: ask several scientists to answer the same question, and they each will respond by performing different experiments that likely will lead to different answers.

The Vinland Map is a piece of parchment with a map of the world inked on it. It first became news in 1965 when Yale University scholars announced that they had purchased the map, which they thought was the work of a copyist working in Basel, Switzerland, probably during the great church council held there from 1431 to 1449. The map created a sensation because it depicted a land mass to the west of Greenland, and it was a fair chunk of land—an island bigger than the map's Greenland, with two inlets on the east side. This was the New World. It bore the label *Vinlanda Insula*, and there was also a legend describing the discovery of the land by the Vikings Leif Ericsson and Bjarni Herjolfsson. If the map were authentic, it would be the only known map prior to Columbus to show the existence of the New World. This of course would be sensational enough, a once-in-a-lifetime event, but the Vinland Map created even more controversy because of the complicated and mysterious route by which it came to Yale. An unidentified European sold the map and an associated document called the Tartar Relation to a New Haven book collector, Laurence Witten. At about the same time, but entirely unknown to Witten, Yale purchased a third document called the *Speculum Historiale*. In a coincidence almost

MAP

SKELETON, MARSTON, PAINTER, THE VINLAND MAP AND THE TARTAR RELATION, YALE UNIVERSITY PRESS

The controversial Vinland Map is owned by Yale University.

beyond belief, the three documents fit together: apparently the Vinland Map had originally been bound together with the *Speculum* and the Tartar Relation. Even the wormholes matched.

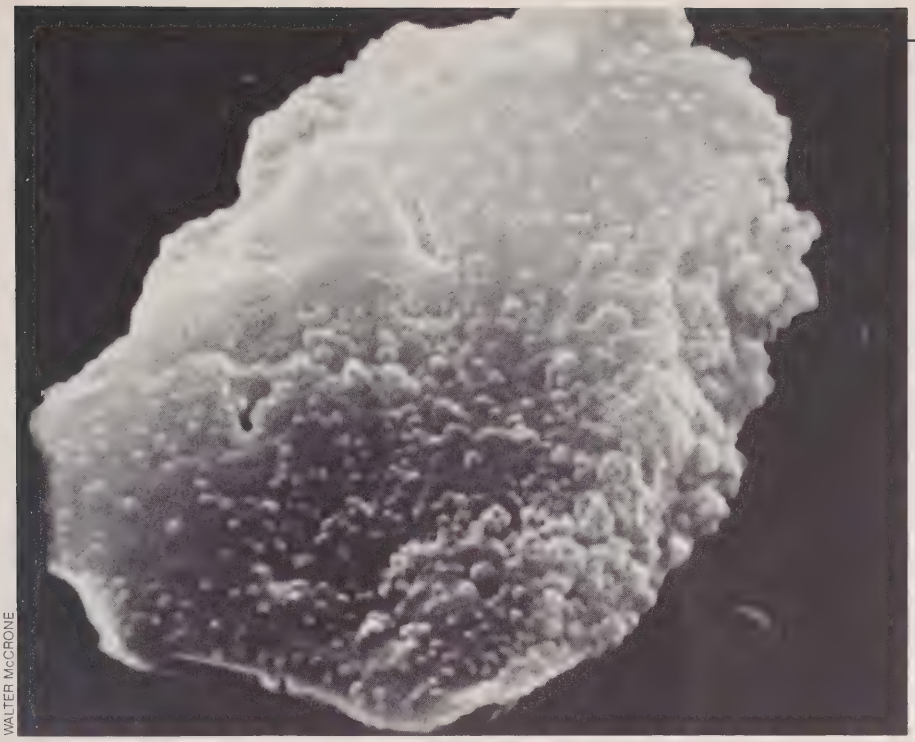
The Vinland Map had no sooner been unveiled in 1965 (ironically, on the day before Columbus Day) than the doubters went public. Who was the European who had had the documents in his personal library? His name was being kept secret. Why? Laurence Witten explained that the mystery man wanted to avoid taxes. True or not, this explanation only heightened scepticism. Deprived of the opportunity to trace the map back through its previous owners, experts could only question whether the map seemed reasonable. (It wasn't just experts: Columbus partisans, angered by the timing of the map's unveiling, launched a vigorous anti-Vinland campaign.) No one doubted that the Vikings had indeed visited the New World—the settlement at L'Anse aux Meadows in Newfoundland is ample evidence. But if they had visited North America around 1000 A.D., how had that information reached the church council in Basel over four hundred years later? Why was the New World recorded for the first time on the Vinland Map?

There were even nagging questions that had nothing to do with the depiction of Vinland itself: for instance, the entire coastline of Greenland is mapped in detail, suggesting that whoever was the source of this information had circumnavigated the island. But this isn't as easy as it sounds. Much of the northern part of Greenland is buried under ice, and there is no way of telling what is land and what is ocean. In fact, details of the northern silhouette of Greenland weren't known until the 1870s. Could the Vikings have worked their way around the coast of Greenland centuries ago at a time when the climate was more moderate, thus allowing sailing where today none is possible? And if that is true, why isn't Ellesmere Island marked on the Vinland Map? You can't miss it when you are sailing down the west coast of Greenland. On the other hand, it was convention in the Middle Ages to represent partially explored lands as islands, so it's possible that Greenland would have been depicted that way whether anyone sailed around it or not.

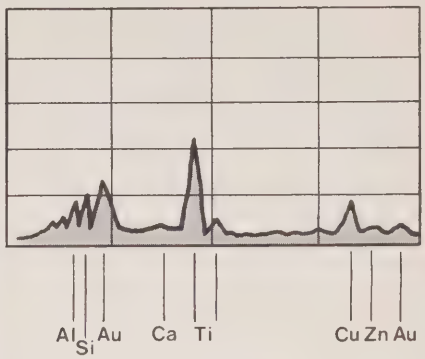
It was a curious situation, believers and sceptics becoming inflamed over a map that, even if authentic, only demonstrated cartographically what was already widely accepted from the Viking sagas and the settlement at L'Anse aux Meadows. But there is something special about seeing the New World on a map for the first time. Yves Berger, writing about the David M. Stewart map collection that appeared at the ROM last year stated: "This world, robbed of its distances and mystery, can only be known as it used to be from maps . . . [they] gradually performed an unveiling of the earth, spelled-out and named." Exciting as that collection of maps is, think of seeing, for the first time, a map from the 1440s showing the New World. It's no wonder that feelings ran high.

Fascinating as the academic discussions about the map were—and they ranged from the significance of the depiction of land masses within the context of other 15th-century maps to the putative identity of the actual author of the map—they were ultimately unsatisfactory. They did not provide a clear-cut answer to the question of the authenticity of the Vinland Map. What many felt was needed was science: hard objective science that would provide unambiguous data to settle the question once and for all. The only real problem was choosing the appropriate technique. Finally on 10 February 1972, the Yale library decided to put the Vinland Map to the test. And the man chosen to do the testing was Dr Walter McCrone.

McCrone, a Chicago scientist, had built up a reputation as a microscopist supreme: his six-volume work *The Particle Atlas* is a standard reference on the analysis and identification of microscopic particulate matter of all kinds. McCrone and his associates took fifty-four extremely tiny samples from the surface of the Vinland Map (tiny enough that all fifty-four weighed less than a millionth of a gram, and if piled together would be barely visible to the naked eye) and examined them with an array of technologies: microscopes,



WALTER McCRONE



Above: The energy dispersive X-ray analysis of an ink sample from the Vinland Map, conducted by Walter McCrone, showed high quantities of titanium (ti).
Left: A single particle of ink from the top of the letter "B" of the word Byarno located under the words Vinlanda Insula on the upper left corner of the Vinland Map. McCrone believes that the tiny bumps on this ink particle are quite likely particles of anatase (titanium oxide).

ion microprobes, and X-ray and electron diffraction, all aimed at determining exactly what substances were present in the Vinland Map. His conclusion wasn't long in coming, and it was a shocker; the analysis showed that the ink of the Vinland Map contained very large amounts of titanium, in some places up to fifty per cent. Titanium is a metal that when combined with oxygen forms a titanium oxide called anatase, which is used extensively today as a white pigment. It is extremely unlikely that a 15th-century ink could have contained up to fifty per cent titanium. But the clincher came when these pigment particles were examined with the electron microscope. (These particles are so small that one hundred thousand of them lined up would just cover the distance across your little fingernail.) The microscope showed that these titanium-containing crystals are round and regular in shape, typical of those created in industrial chemical processes first used to manufacture titanium pigments in the 1920s. According to McCrone's report, it was as likely that a five-hundred-year-old map contained pigment globules like the ones he saw as that "Admiral Nelson's flagship at Trafalgar was a Hovercraft."

Thus the Vinland Map was a fake. A 20th-century forger had been caught using 20th-century ink. McCrone's reputation soared as magazines both scholarly and popular lauded his detective work. *Time*, *Chemistry*, and *Analytical Chemistry* published stories, and within weeks the Vinland Map faded from public attention, only occasionally to be revived to make the point that technology had been able to set the record straight or to buttress Walter McCrone's reputation as he went on to become involved in the study of another controversial artifact, the Shroud of Turin.

But there remained those who were not absolutely convinced that McCrone was right, and who still felt that there was plenty of evidence outside the microanalysis to suggest that the Vinland Map was genuine. Alan Pooley, a researcher at Yale University and one of the authors of the just-published *Analytical Chemistry* paper, expresses some of the doubts that existed about the McCrone work: "It was almost too spectacular. There *was* titanium, but it wasn't clear what the concentrations were, and there wasn't a perfect correlation between the ink and the titanium. That is, in some places there seemed to be ink but no titanium. And finally it was a huge extrapolation to make from a total sample of less than a millionth of a gram of material." So while most people assumed that Walter McCrone's science had resolved the Vinland Map controversy, a small minority demurred; they believed science could resolve the problem, as long as it wasn't McCrone's science. This group needed

a new scientific approach to validate their faith in the Vinland Map and their objections to McCrone's analysis. They found it with PIXE.

PIXE stands for particle induced X-ray emission. A high-speed beam of protons (particles from the nuclei of atoms) is aimed at the object of interest, in this case the ink line on the Vinland Map. The protons knock electrons out of the atoms present in the ink line, which forces these atoms to make an internal shuffle of their remaining electrons to replace the missing ones. As they do so, they emit X-rays. The key to the technique is that every different chemical substance emits different X-rays. By aiming the proton beam at the Vinland Map, one could record the kinds of X-rays that were emitted, and thereby identify what was there. And if there had been, as Walter McCrone claimed, huge amounts of the modern form of titanium called anatase in the ink of the Vinland Map, copious X-rays typical of titanium would have been emitted. But they weren't. The proton beam method records hardly any titanium on the Vinland Map at all.

Dr Tom Cahill ran the analysis of the Vinland Map on the PIXE machine at the University of California at Davis. He heads a group that has analysed more than a thousand ancient documents, including recently an exhaustive testing of the Gutenberg Bible. The proton beam that scanned the ink lines on the Vinland Map found levels of titanium tens to hundreds of thousands of times *less* than those claimed by Walter McCrone. But even more astonishing, Cahill reports seeing *no crystals at all*; he observed only a gradual change in shade from one colour to another as the beam moved across the map.

Cahill and his colleagues went even further: they drew fake map lines using a modern titanium-based ink on a 16th-century piece of parchment. Then they erased those lines to the point where they were no longer even visible to the naked eye, and still found levels of titanium twenty-thousand-times higher than on the Vinland Map. So PIXE can detect 20th-century titanium in a fake ink, even when the ink line is invisible. If the Vinland Map is a 20th-century fake, then where is the titanium?

Why are there such obvious contradictions between McCrone's and Cahill's work? One of them must be wrong if one finds titanium and the other doesn't, but neither man is giving ground. Walter McCrone is still convinced that his approach is the right one, and that there are serious shortcomings with the proton beam technique used by Tom Cahill: "In the first place, they're not working with a micro-instrument. PIXE surveys a fairly large area, several millimetres square. On that basis, the titanium is averaged out. Remember, the titanium is concentrated in a very fine line." Tom Cahill doesn't quarrel at all with McCrone's attention to the issue of where the titanium is concentrated: "That is, in fact, the heart of the argument. Let's say there's a piece of ink and he pulls a crystal off it, and it's fifty per cent anatase. He extrapolates to say the whole ink is fifty per cent anatase. Because we analysed all the ink present, we have to extrapolate nothing. We found that the ink was highly variable across the map: some of it has titanium, some doesn't." And what of the fact that Walter McCrone photographed modern-looking titanium particles? Tom Cahill doesn't have an answer for that, but he does point to the fact that anyone, or anything, that has been in a room painted with modern white paint has been in the presence of large amounts of titanium oxide in the form of anatase because it is the most common white pigment in use today.

The publication of Cahill and Alan Pooley's paper in *Analytical Chemistry* will no doubt attract comment, pro and con. But it really shouldn't be a surprise that two scientists with different techniques can present diametrically opposed answers to the same question. The Vinland Map affair is just another example of how science never has been and is not now the impartial, objective pursuit of the truth that it is often claimed to be. Scientists bring to their work the same human foibles as do we all, and these include biases, both conscious and unconscious. Was Walter McCrone a little too hasty to conclude from his tiny samples that all the ink on the Vinland Map was loaded with titanium? Would Alan Pooley and Tom Cahill have gone to the trouble of retesting the map if they thought that it was a fake?

COURTESY TOM CAHILL

Tom Cahill *(left)* and Alan Pooley *(right)* adjusted the position of the Vinland Map on the PIXE machine so that the proton beam could be focused on a one-square-millimetre segment containing part of a line of ink.

Testing the authenticity of the Vinland Map is not mainstream science: it is not, strictly speaking, part of the effort to understand nature. However, very often it is in just this kind of situation, where science is brought in to resolve a controversy, where many experts' territories are being crossed, and especially where there is a hint of fraud, that you see clearly just how human is the pursuit of science.

Objective and unbiased? Many of the early critics of the Vinland Map went public with their criticism without even seeing the map. Most sceptics then felt the case was closed when Walter McCrone completed his analysis, but few of them actually read his report. In fact, his report never appeared in a scientific journal; it was conveyed directly to the Yale University library. Journals like *Chemistry* and *Analytical Chemistry* reported the conclusions as a chemistry news story without ever publishing the full report as a piece of research. But no matter: the simple fact is that to most of the public and even to many academics, science is science. Turn on a scanning electron microscope fitted with an energy-dispersive X-ray analyser, and you get scientific data, which represents some sort of objective truth. So far two studies have been conducted on the Vinland Map, which have resulted in two different objective truths.

It is still too early to tell what the reaction will be to the recent proton beam analysis of the Vinland Map. There may be others who feel, as Walter McCrone does, that it's not an appropriate technique, and so the debate will continue. But you don't have to become embroiled in the niceties of PIXE versus electron microprobes to want to know the answers to these questions: why can't Tom Cahill see any of the particles McCrone saw and photographed? Where did the particles of 20th-century titanium come from? And if they are just a contaminant, do they appear also in areas of the map where there is no ink?

There is also the question that has to be raised in any controversy where fraud has been suggested. What would have been the forger's motive? Laurence Witten, the bookseller who bought the map from the still-mysterious European owner, paid $3500 U.S. There seems to be no reason to question that figure. But is Witten telling the truth? And if money isn't the motive, would someone go to the trouble of forging the Vinland Map just to tweak the noses of the experts?

One thing is certain. If the Vinland Map is real, then some 15th-century monk would be bemused, to say the least, to know that Vinlanders living five hundred years after his time are picking microscopic ink samples off his map and shooting invisible particles through them, or scanning his ink lines with high-energy beams in order to determine if he actually had drawn the map. It would seem to him the kind of attention that would be more properly paid to examining the angels on the head of a pin.

Jay Ingram is host of CBC Radio's popular science program "Quirks and Quarks" and a regular contributor to Owl *and* Rotunda *magazines.*

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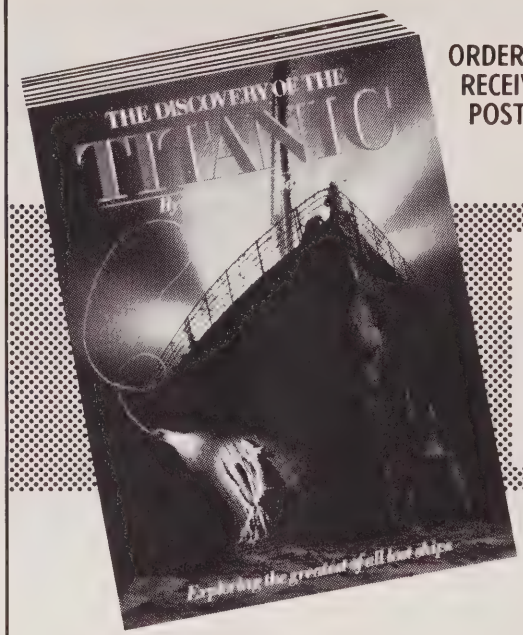

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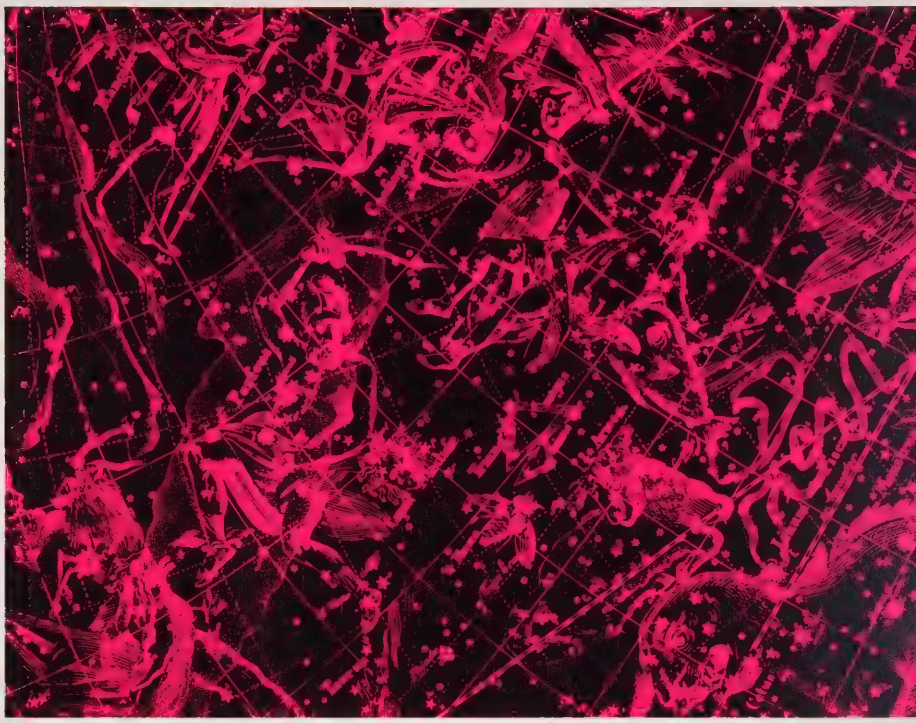
Who Gave the Constellations Their Names?



COURTESY McLAUGHLIN PLANETARIUM

Artist's conception of some of the constellations seen in the northern hemisphere from the *Uranographia Sive Astrorum Descripto* by J. E. Bode, published in 1801.

A clear, dark, moonless night reveals a sky filled with thousands of stars. These points of light, in reality distant suns rivalling our own sun in size and energy output, have fascinated people around the world for thousands of years.

For most skywatchers, the stars do not seem to form recognizable patterns or arrangements. If we look at books on astronomy or sky charts, however, we find the sky is filled with images of animals, people, monsters, and objects. Imaginary lines join the brighter stars to create strange creatures such as a winged horse, a sea monster, or a great archer.

ANKER ODUM

Together, these pictures are called the constellations. There are eighty-eight official constellations. Some constellations are well-known and easy to identify, but others require a good imagination and a trained eye to find. Most people can locate the seven stars of the famous Big Dipper in our northern sky every evening.

Who named the constellations? How did someone decide that a certain group of stars looked like something even when most of us cannot see the resemblance? Many books suggest that the constellations were named by shepherds, who while watching over their animals, amused themselves by imagining great heroes and strange creatures populating the starry skies above.

All ancient people were sky-watchers. The predictable motions of the sun and the moon were important for agriculture, religion, and the timing of major festivals. The background of fixed stars, rising, setting, and turning as the earth rotates on its axis, could be used by navigators to guide their ships at night. The Sumerians and Babylonians, who inhabited what is today Iran, Iraq, and Syria, the Egyptians of the Nile Valley, and the civilizations of China all had their own systems of constellations. Is it possible to pinpoint a time, a place, and a people who developed the system of constellations that we know today?

Part of this question is easy to answer; forty of the official eighty-eight constellations were named within the last five hundred years. The remaining forty-eight constellations are often called the "classical" constellations because we first learned about them from a document written by the great astronomer Claudius Ptolemy, who lived in the city of Alexandria in Egypt about A.D. 130. Ptolemy was the last great astronomer of the civilizations surrounding the Mediterranean Sea from which our modern civilization developed.

However, through some clever detective work, astronomers discovered descriptions of the constellations that were earlier than Ptolemy's. A renowned astrono-

FOR THE YOUNGER READER

mer and mathematician named Eudoxus, who lived about five hundred years before Ptolemy, unknowingly described the stars in the sky as they appeared two thousand years before his own lifetime. From what civilization was this information passed down? Scientists think that it is most likely the Minoans of Crete. The Minoans were great sea traders in the eastern Mediterranean and they probably used star patterns for navigation. Thus they would be the creators of many of the classical constellations that we know today.

On a dark, starry evening, it might be interesting to think of the ancient Minoan seafarers of four thousand years ago, and imagine them recognizing and naming so many of the constellations that we can see.

IAN G. MCGREGOR

Dear Dr ROM,

Why are some stars brighter than others?

Jocelyn P.
Scarborough

Dear Jocelyn,

There are several reasons why some stars appear brighter than others. First of all, some stars are *larger* than others, and therefore brighter. Secondly, some stars appear brighter because they are *closer* to the Earth. Finally, because some stars are *hotter* than others, they appear brighter.

If you have a question for Dr ROM, write to:
Dr ROM
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Royal Ontario Museum
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Musers' Quiz

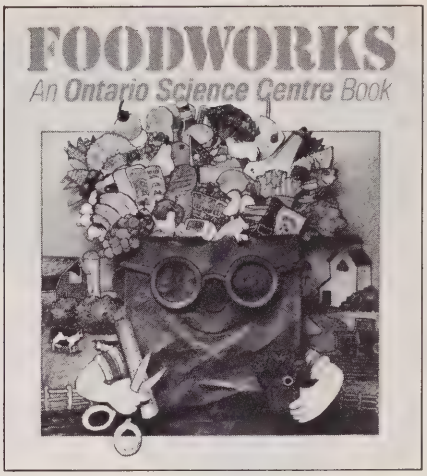
Unscramble these constellations!

9. UUSTAR
10. OLE
1. ISSCEP
2. ROONI
7. LRHCSUEE
8. CPIOARS
3. GUESAPS
4. MIINGE
5. OMDEARNAD
6. RQUIAUSAU

ANSWERS

1. PISCES
2. ORION
3. PEGASUS
4. GEMINI
5. ANDROMEDA
6. AQUARIUS
7. HERCULES
8. SCORPIO
9. TAURUS
10. LEO

SUSAN GILBERT



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The answers, explanations, and well-placed illustrations form the body of the book. There are quizzes, a board game, and a number of recipes—including one for making your own ginger ale.

Foodworks grew out of a major exhibition that was on display at the Ontario Science Centre for several months this year. Through this book, children everywhere have a chance to learn about food in a way they never have before.

Recommended for grades four and up

Review reprinted from The Children's Book News *courtesy of The Children's Book Centre, Toronto*

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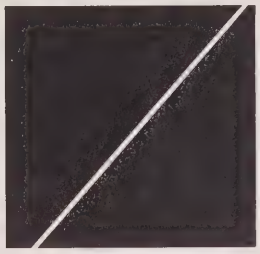
Rick Winterbottom *(left)* and Mary Burridge-Smith *(right)* hold the ROM's frozen coelacanth.

▶ Thanks to the generosity of Mr Peter Stevens, a Toronto businessman, the ROM Department of Ichthyology and Herpetology recently acquired a frozen coelacanth, one of a rare species of prehistoric fish. Coelacanths, which have been found only in the deep waters off the Comores Islands near Madagascar, are between 1.2 and 1.5 metres in length with dark blue scales and lobed fins. Scientists using fossil records have established that these fish lived from at least 325 million years ago, preceding dinosaurs by approximately 130 million years. Until the first living specimen was caught in 1938, however, it was believed that coelacanths had become extinct during the Cretaceous period, sixty-five million years ago.

The specimen will provide ROM scientists with a rare window on evolution because these fish have remained virtually unchanged for millions of years, and are the closest living relative of the animals that gave rise in the evolutionary chain to amphibians and higher vertebrates. Although approximately one hundred specimens can be found in various collections, frozen (rather than preserved in alcohol) coelacanths are even more rare and valuable because of the genetic studies that can be conducted on their undamaged tissue and organs. At present the ROM and the New York Aquarium are the only institutions in North America to possess frozen coelacanths.



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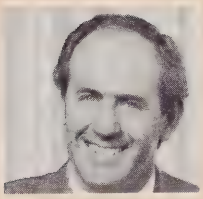

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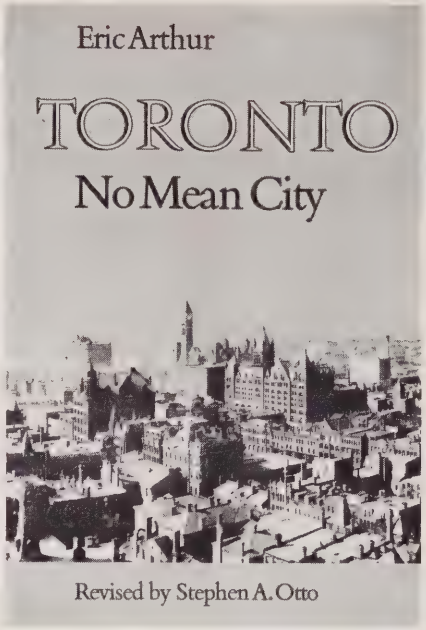

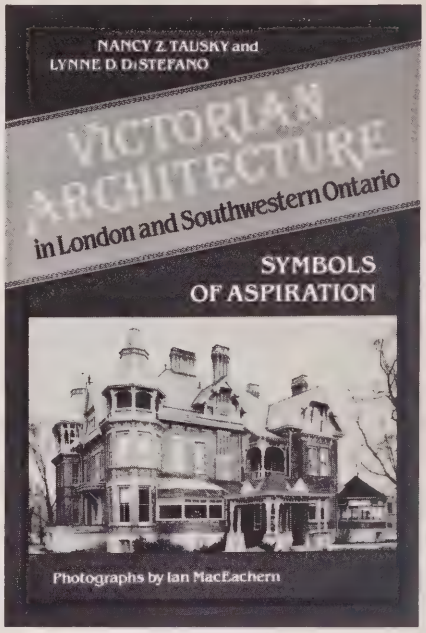

Toronto, No Mean City
Eric Arthur
Third Edition, Revised by
Stephen A. Otto
University of Toronto Press
315 pp. $18.95 (paper)
$40.00 (cloth)

Victorian Architecture in London and Southwestern Ontario
Nancy Z. Tausky and
Lynne D. DiStefano
with photographs by
Ian MacEachern
University of Toronto Press
493 pp. $34.95 (cloth)

Reviewed by Geoffrey Simmins. Mr Simmins is researching a monograph on Toronto architect Frederic William Cumberland (1820–81).

Somewhere above Toronto the ghost of the late Eric Arthur is probably smiling, looking down in pleasure at the latest incarnation of his best-known book, *Toronto, No Mean City.* Published in 1964 (with a revised edition a decade later), this classic has been given new life in an extensively revised and now utterly reliable third edition.

Stephen Otto, who revised the book, is known in local circles as a haunter of archives, an avocation that has made him as knowledgeable as anyone about 19th-century Toronto. With this publication he accedes by acclamation to the chair that Arthur left empty as the guiding spirit and unofficial doyen of the city's architectural history.

The new edition preserves much of Arthur's text and adds to it the fruits of research undertaken since the second revised edition was published.

A major revision was necessary. Our ideas about early Toronto have changed significantly even in the ten years or so separating the more recent editions. Architecture is being reassessed through the rich J. C. B. and E. C. Horwood architectural drawings collection, comprising thousands of sheets of drawings by many of Ontario's leading architects. The collection was donated in 1979 to the Ontario Archives. A systematic effort has been made to comb 19th-century newspapers for accounts of builders and architects. Still more information has been obtained from a group of twenty-five recently rediscovered photographs taken in 1856. Otto draws on each of these sources and includes many new illustrations from them.

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In addition to the new illustrations, new information is unobtrusively added: changed attributions, demolition and construction dates, a valuable updated appendix on Toronto architects, and a useful new appendix on Toronto builders. The text has also been subtly but thoroughly edited. In the section on Osgoode Hall, whose building history has been contentious, a new chronology is deftly patched in. Even captions have been checked and modified to accord with information from painstaking research.

Arthur was among the pioneers of Canadian architectural history; his enthusiasm for his subject made it easy to forgive him his excesses or shortcomings. Otto represents a new breed, those who have ferreted out more fully the factual accounts and new documentary evidence of which earlier historians had no knowledge.

❦

Another example produced by the new breed of historians is found in *Victorian Architecture in London and Southwestern Ontario: Symbols of Aspiration*. This work—apparently eleven years in the making—provides a history of architecture in the London region by focusing on one long-lived firm, that founded by William Robinson in 1857 and carried on by successors George F. Durand, John M. Moore, and others. The book consists of two parts: introductory chapters followed by a longer catalogue of works. Such an organization was probably chosen because the book was simultaneously the record of a touring exhibition initiated at the London Regional Art Gallery. Its scholarly apparatus is impressive (although a bibliography is not included) and so are modern photographs by Ian MacEachern.

The authors shared the historical research and architectural analysis, but Tausky, who teaches English at the University of Western Ontario, wrote most of the text, while DiStefano, who teaches architectural history at Brescia College, assumed curatorial and managerial

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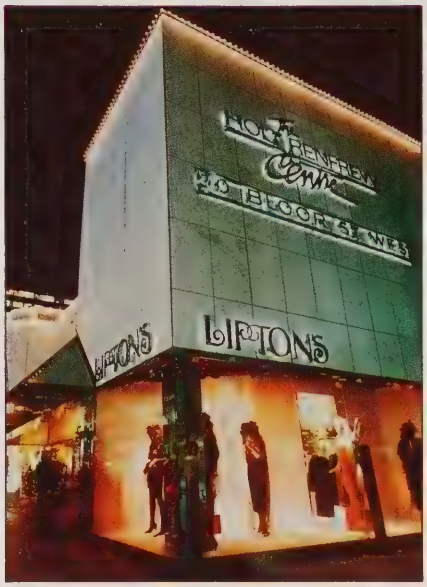

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functions associated with the exhibition.

This is a vast and somewhat ponderous tome, a valuable book that takes hard slogging to make one's way through. The authors' presentation of their material is diffuse. All too often, instead of concentrating on the new ground that is theirs to stride on, they take the reader on exhausting tramps through well-known areas of architectural history that does not need visiting. That is, there is a curious and constant tension between developments in the London region and the impossibly larger European context. For example, the discussion of London's court house is interrupted by a long digression about architectural history beginning with the Greeks and Romans through to Palladio and thereafter through to pattern books in Canada. One has to sympathize with the authors' dilemma: historians of architecture in Canada always must struggle to strike a balance between parochial concerns and the larger streams which informed debates even here. Most general readers will be puzzled by this approach and most specialist readers will find themselves skipping over large sections almost instinctively.

There are still some rich fruits in this tangled orchard. In one chapter, titled "The Architect in Victorian Canada," the authors provide what may well be the most comprehensive analysis of the architect in Victorian Canada. Not only do they trace the history of technological developments that affected the architect's practice—the use of iron, glass, brick, and steel (and they do this both for Canadian and international developments)—they consider in commendable detail issues germane to the nature of the profession itself, such as whether the architect of this period could be differentiated from the surveyor and the engineer, what he read, and how he studied or apprenticed.

Arthur's book helped awaken concern for historical conversation; twenty-odd years later Tausky and DiStefano hope that theirs will do

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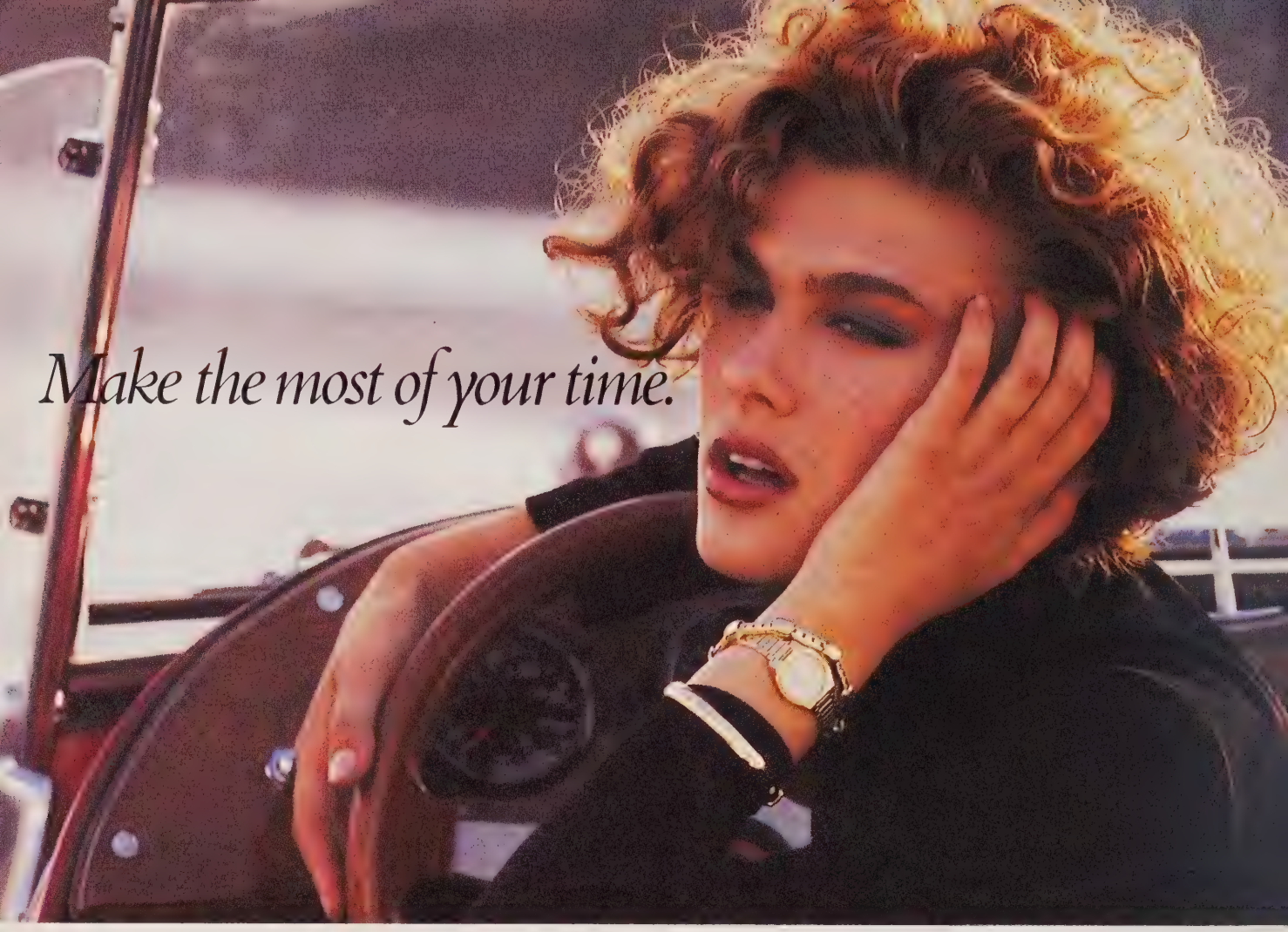

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the same. As they remark in their preface, "Our own aspirations will be fulfilled if the book helps future preservationists appreciate the integrity of Canada's Victorian heritage."

The Burgess Shale
Harry B. Whittington
Yale University Press
151 pp. U.S. $25

Reviewed by Desmond Collins, curator, Department of Invertebrate Palaeontology, ROM

It is appropriate that the first comprehensive book on the Burgess shale was published last year during the centennial of the Canadian Pacific Railway. CPR workers were the first to pick up fossils from the trilobite beds on Mt Stephen (named after the President of the CPR) overlooking the CPR line at Field, British Columbia, in 1886. It was this discovery that induced the famous palaeontologist, Charles D. Walcott, to visit the area where he found the first Burgess shale fossils in 1909. Walcott excavated the site for five seasons, amassing a collection of over 65 000 specimens, but he published only preliminary descriptions of the fossils. These were enough to demonstrate the exquisite preservation of the fossils and to establish the presence in Cambrian seas of soft-bodied animal groups whose fossil record was otherwise poor or absent. Consequently, Walcott's descriptions made the Burgess shale fossils legendary, but they did not provide information necessary for detailed comparisons with other fossils.

The Geological Survey of Canada (GSC) sponsored a restudy of the Burgess shale beginning in the early 1960s, and invited Harry B. Whittington, then at Harvard University, to take charge of the palaeontological work. The Smithsonian collections, particularly those made by Walcott between 1911 and 1917, which were largely unstudied, and the GSC collections made in 1966

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and 1967 formed the basis of the restudy.

Whittington and his Cambridge University colleagues (he moved there in 1966) have written some forty articles on Burgess shale fossils. Their discoveries are astonishing. Where Walcott had identified arthropods, annelid worms, sea-cucumbers, anemones, and jellyfish, all from known families, Whittington and his team have found arthropods which do not fit into the current classification, polychaete and priapulid worms, a sea-cucumber, a chordate, no jellyfish, and a large number of animals from no known group. Walcott's Cambrian seas were thus filled with representatives of living invertebrate animal groups, whereas Whittington's seas included a host of bizarre animals that have since become extinct. Consequently, from an evolutionary point of view, the Burgess shale fossils are now recognized as the most important fauna in the fossil record.

The Burgess Shale is divided into five chapters. The first three "Cambrian World," "Walcott's Discovery and Subsequent Work," and "Formation of the Burgess Shale and Preservation of the Fossils" provide an excellent lead-up to the main chapter "Fossils of the Burgess Shale." The fossils are subdivided into Porifera, Trilobita, Mollusca, etc. and are described briefly in a narrative revealing their diagnostic features and significance, much like a detective explaining how he solved the mystery. I found myself wishing for descriptions and discoveries of the many forms mentioned only in passing. The bizarre forms are described in the chapter "Miscellaneous Animals." This is the one section where the narrative could have been more vivid, but with the exception of a brief account of the elucidation of the bizarre *Anomalocaris*, there is little of the excitement of unravelling the mystery of these extraordinary animals that were buried half a billion years ago. Eighty-three illustrations of the fossils are provided in this chapter. This is the most disappointing

feature of the book because its small size and matt reproductions do not do justice to some of the more spectacular fossils.

The final chapter is the best. Titled "The Burgess Shale Fauna and Flora and its Evolutionary Significance," it presents the taxonomic composition of the fauna, demonstrating that arthropods were already dominant in the Middle Cambrian as they are today in the form of insects. Whittington discusses how the animals may have lived and interacted, the relationship of the Burgess shale fauna to that of the earlier soft-bodied Ediacaran fauna, and what this implies for evolutionary biology. First appearances of different invertebrate groups are listed. Lastly, we are told about the life of the Cambrian in particular, and the nature of the fossil record in general.

An appendix lists all of the species known from the "Phyllopod Bed." In fact it also includes species restricted to Raymond's quarry located twenty-one metres above. Plant and animal details which are not presented in the book can be gleaned from the list of publications at the end.

Whittington's book shows that the task of describing and interpreting the animals of the Burgess shale begun by Walcott in 1911 is largely done. It is not the last word, however, because new Middle Cambrian localities in British Columbia and Utah and a new Lower Cambrian locality in China are yielding new fossils of the Burgess shale type. Whether the new faunas will provide major additions to the Burgess shale story is still unknown, but they look promising. For the present, *The Burgess Shale* does very well as the outstanding account of the record of the marine life of 530 million years ago. It should be in the libraries of all universities that teach palaeontology and evolutionary biology, and of all natural history museums that exhibit fossils.

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The Colour Purple

ANKER ODUM

1. Certain molluscs, the creatures that build and inhabit sea shells, produce from a gland a liquid that on exposure to sunlight gradually turns from yellow to green to blue, and finally to purple. Two questions: who were the first people to make use of this purple liquid, and what did they do with it?

2. Porphyria is a general name for a variety of blood disorders, some of which cause the sufferer to excrete port-wine-coloured urine. The name is derived from *porphyra*, the Greek word for purple. Some porphyrias can cause extreme sensitivity to sunlight, tightening of the gums, and disfiguring skin lesions. Recently it has been suggested that porphyric humans provided the model for some ghastly and very scary creatures featured in horror stories. What creatures?

3. Purple Martins are large blue-black North American swallows that live mainly in bird "apartment" houses. They are renowned for their consumption of mosquitoes, which, accomplished flyers that martins are, they seize on the wing. From what language is the word martin derived?

4. You're in a tight spot at the office, faced with a boss whose face is "purple with anger." Is this better or worse than if he/she had a face "white with rage"?

5. The great Isaac Newton listed seven colours in the visible spectrum, but the shade next to violet is so hard to distinguish that many people today ignore it. What is that colour?

JAY INGRAM

The answers are given below.

1. The glandular secretion from the molluscs was used as a dye called royal tyrian purple, and the first people known to have used it were the Minoans, the great civilization that lived on the island of Crete about 3500 years ago. Later the Phoenicians and the Romans used the dye, and both Aristotle and Pliny wrote about its preparation, which involved crushing the shells in order to extract the animals, steeping the slippery bodies in salt water for three days, and then boiling them. It may not have been the most delicate of jobs, but the resulting dye was fabulous to look at and expensive to buy, because every pound of wool required six pounds of dye. In the time of Caesar Augustus a pound of dyed wool cost approximately $200 Canadian. But stories about the quality of the dye abound. When Alexander the Great took Susa, he found 5000 pounds of cloth still brilliantly purple nearly two centuries after being dyed. Oddly enough, no one knows why the molluscs produce the purple stuff in the first place.

2. Vampires. David Dolphin of the University of British Columbia is a chemist specializing in the molecular structure called the porphyrin ring, but as a sidelight he has proposed the following. There's one specific porphyria that results from the body's inability to combine efficiently an iron atom and a porphyrin molecule. That combination is called haem, and it's the critical part of the haemoglobin molecule in the blood. People with this disease, if untreated, are so sensitive to light that they only come out at night; their gums pull back from the teeth giving them a fanged appearance; and one way their lack of iron-containing porphyrins could be remedied is by drinking blood. The most intriguing connection is found in the esoteric biochemical details of blood metabolism. In addition to haemoglobin, there is an enzyme in the blood that also contains haem. But when that enzyme attacks certain substances, it self-destructs and its haem is ruined, which only augments the problem for those suffering from porphyria. And what dietary item (and anti-vampire talisman) is one of those substances? Garlic. There is one final note. A so-called vampire was executed in Brazil in the early 1700s, and when his body was exhumed in the 20th century, his skeleton was loaded with porphyrins—porphyrins that lacked iron.

3. The word martin is originally French, but the French word, in turn, is derived from the Latin word *Mars*. Martin is actually a diminutive of Mars: little Mars. But why should the word martin be applied to this bird? Ernest Choates, in his *Dictionary of Bird Names*, suggests two possibilities: the Romans might have called these swallows little Mars

Continued on page 80.

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—ROTUNDA QUIZ—

because they appeared during a festival for Mars, the god of war. An alternative explanation is that the bird is named after St Martin, the patron saint of, among others, innkeepers and drinking friends. Was it, Choates asks, that the erratic zig-zag flight of martins called to mind the similar movements of St Martin's flock? (By the way, martins do not eat very many mosquitoes.)

4. Actually you are better off if your boss's face is "purple with anger." The white of "white with rage" is a signal that blood is being diverted by the autonomic nervous system to the brain and muscles in preparation for physical action. If the whiteness is that of anger, and not fear, an attack might be imminent. The purple accompanying rage is caused by blood rushing to the skin. Either the original nervous message has been amended, or the anger never actually reached the stage of preparing for attack. While your boss might still be very angry, you are not in any kind of physical danger. As the majority of humans have naked faces, these signals are particularly easy to see.

5. Indigo. G. Hugh Begbie, in his entertaining book *Seeing and the Eye*, claims that we can normally recognize just six colours, but that Newton added indigo as the seventh, possibly because seven is a magic number, and "Newton . . . was deeply interested in the occult." A nice story, but in reality it is not quite as straightforward as Mr Begbie would have us believe. In fact early in his investigations of light, Newton referred to just five colours in the spectrum of white light: red, yellow, green, blue, and purple, omitting both indigo and orange from the usual seven. In later life he referred to the full list of seven, even drawing comparisons to the identical number of intervals in the musical scale. And it might not have been so much an interest in the occult as in alchemy that prompted Newton to go with seven. The alchemists traditionally worked with seven different metals, and the economist John Maynard Keynes, who purchased much of Newton's alchemical writing at an auction, was so impressed with the depth of Newton's interest in alchemy that he called him "the last of the magicians." Did Newton really think that there was a specific number of colours in the rainbow, or did he just assign an arbitrary number to what he recognized was a smooth gradation of shades? Scholars disagree on this question.

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